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B Plant Complex Preclosure Work Plan

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1.0 INTRODUCTION

This preclosure work plan describes the condition of the dangerous waste treatment, storage, and/or disposal (TSD) unit after completion of the B Plant Complex decommissioning Transition Phase preclosure activities. This description includes waste characteristics, waste types, locations, and associated hazards. The goal to be met by the Transition Phase preclosure activities is to place the TSD unit into a safe and environmentally secure condition for the long-term Surveillance and Maintenance (S&M) Phase of the facility decommissioning process.

This preclosure work plan has been prepared in accordance with Section 8.0 of the *Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement)* (Ecology et al. 1996). The preclosure work plan is one of three critical Transition Phase documents, the other two being: *B Plant End Points Document* (WHC-SD-WM-TPP-054) and B Plant S&M plan. These documents are prepared by the U.S. Department of Energy, Richland Operations Office (DOE-RL) and its contractors with the involvement of Washington State Department of Ecology (Ecology).

The closure plan for the TSD unit will not be prepared until the Disposition Phase of the facility decommissioning process is initiated following the long-term S&M Phase. Final closure will occur during the Disposition Phase of the facility decommissioning process.

The Waste Encapsulation Storage Facility (WESF) is excluded from the scope of this preclosure work plan.

BACKGROUND

The B Plant Complex is located in the northwest portion of the 200 East Area of the Hanford Site (refer to Chapter 2.0, Figure 2-1). The 221-B Building, also known as B Plant, was designed and constructed between 1943 and 1945 to recover plutonium using a bismuth phosphate chemical separation process. B Plant operated as a plutonium recovery facility from 1945 to 1952. With newer and more efficient plutonium recovery facilities becoming operational, B Plant was shutdown in 1952.

In the late 1950's, there was a growing concern about the heat generated by high activity radioactive waste stored in the Hanford Site single-shell tanks. Some of the waste generated enough heat to cause the liquid waste to boil. A program to partition the high activity waste to remove some of the high-heat isotopes was developed. After a period of experimentation and process development, B Plant was selected to house the large-scale partitioning mission. Modifications to B Plant started in 1962 and were completed in 1967. Between 1968 and 1983, B Plant separated various isotopes from the waste. Over 100 million curies of strontium-90 and cesium-137 were recovered. B Plant also supported storage of the strontium and cesium capsules at the WESF since 1974.

From 1984 through 1985, B Plant was prepared for a demonstration test in the pre-treatment, or preliminary separation, of Hanford Site tank waste. Pre-treatment was to be the first step in processing the onsite waste into a form compatible with long-term storage. In 1990, it was determined that B Plant could not meet modern safety, seismic, and secondary-containment criteria. B Plant was eliminated from consideration as the pre-treatment facility.

Between 1990 and 1995, B Plant provided support to WESF, and commenced limited facility stabilization, cleanup, and cleanout activities. On October 5, 1995, U.S. Department of Energy issued the shutdown order. This included separating the WESF from the B Plant Complex so that the WESF functions independently. The first phase of the decommissioning process, the Transition Phase, is expected to be completed by September 1998.

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2.0 FACILITY DESCRIPTION

This chapter briefly describes the B Plant Complex, the three waste management units within the B Plant Complex, and provides information on Hanford Facility security.

2.1 B PLANT COMPLEX PHYSICAL DESCRIPTION

The B Plant Complex, Figure 2-1, is located in the northwest quadrant of the 200 East Area. The B Plant Complex includes a large canyon building (221-B Building) and several supporting buildings and office trailers. The TSD boundary (Figure 2-2) within the B Plant Complex includes the 221-B Building, the 221-BB Process and Steam Condensate Building (221-BB Building), the 221-BF Process Condensate Effluent Discharge Facility (221-BF Facility), and the 276-BA Interim Organic Storage Facility (276-BA Facility). Specific details of the three waste management units housed in these structures are presented in Section 2.2.

2.1.1 221-B Building

The 221-B Building (referred to as B Plant) is a canyon-type building constructed between 1943 and 1945(Figures 2-3 and 2-4). Processing information is presented in Section 3.0.

B Plant is a steel-reinforced concrete structure 247.04 meters long, with a maximum cross-sectional width of 20.18 meters and a height of 23.53 meters, supported on a 1.83-meter thick concrete foundation. The foundation is 4.88 meters below grade as measured from the north side of the building. The roof is of concrete construction. The roof varies in thickness from 0.91 meter at the midspan to 1.22 meters at the edges where the roof is supported by the exterior walls.

Cutaway and cross-section views of the B Plant canyon are shown in Figures 2-3 and 2-4, respectively. The crane way, the operating gallery, the pipe gallery, and the electrical gallery are located on the north side of B Plant. The hot pipe trench and wind tunnel are located along the south side of B Plant. The lower portion of the canyon, between the two interior walls, is divided into a series of individual process cells. On top of both the process cells and the hot pipe trench are removable concrete cover-blocks. The canyon deck is the area on top of the cover blocks.

A typical process cell is 5.5 meters long by 3.9 meters wide by 8.5 meters deep. A few of the cells are longer, deeper, or both. Each cell is covered with 1.88-meter-thick concrete cover blocks. The process equipment in a cell was designed for remote handling and maintenance. Jumpers were used to make connections between the process equipment and the rest of B Plant. The jumpers could contain piping, electrical connections, and air connections.

The operating gallery, pipe gallery and electrical gallery parallel, but are isolated from, the canyon. The operating gallery contains the process instrument racks and controls and other process support equipment (valves, pumps, chemical addition tanks, etc.) for the in-cell process equipment. The pipe gallery contains the piping and valves that supply various utilities (air, water, steam) and nonradioactive solutions to the in-cell process equipment. The electrical gallery contains the main electrical conduits and electrical distribution centers, and some process control equipment. The hot pipe trench contains pipes connecting the various process cells. These pipes are used for the transfer of radioactive liquids among the cells. The wind tunnel exhausts the ventilation air drawn from the canyon and the process cells to the main ventilation filters. The filtered air is discharged to the atmosphere via a 60.96-meter stack.

An overhead bridge crane spans the width of the canyon. The crane cab rides within the crane way for protection from radiation. The bridge crane is used to remove and install the 1.83-meter-thick cover blocks to obtain access to the cells, remove and install process equipment, and to perform in-cell maintenance. The crane also is used for visual inspection of the canyon deck, process cells, and hot pipe trench after the appropriate cover blocks are removed.

2.1.2 221-BB Process and Steam Condensate Building

The 221-BB Process and Steam Condensate Building is located on the south side of the 221-B Building between the R-13 and R-15 stairwells (Figure 2-2). The 221-BB Building consists of a belowgrade concrete vault (referred to as the condensate pit) and an abovegrade metal building (Figure 2-5).

The condensate pit is constructed of poured concrete and has a length of 5.28 meters, a maximum width of 1.83 meters, and a depth of 2.59 meters. On top of the pit is a steel-frame construction building with metal sides and roof. The building is approximately 2.15 meters from the south exterior wall of the 221-B Building. The metal building is approximately 7.0 meters long by 7.7 meters wide. The 7.7-meter wall is parallel to the south exterior wall of the 221-B Building.

The two vessels in the 221-BB Building condensate pit are part of the Miscellaneous Tank Storage System (Section 2.2.1.5).

2.1.3 221-BF Process Condensate Effluent Discharge Facility

The 221-BF Process Condensate Effluent Discharge Facility is located in the southwest portion of the B Plant Complex (Figure 2-2). The 221-BF Process Condensate Effluent Discharge Facility (Figures 2-6 and 2-7) is a belowgrade concrete vault. The vault is divided into a sample room, a monitor room, and a tank room.

The overall dimensions of the vault are 11.0 meters long by 11.0 meters wide by 8.2 meters deep. An abovegrade stair building is 4.5 meters long by

1.68 meters wide and 2.4 meters high. The stair building is of steel frame and sheet metal construction.

The two vessels in the 221-BF Facility tank room are part of the Miscellaneous Tank Storage System (Section 2.2.1.5).

2.1.4 276-BA Interim Organic Storage Facility

The 276-BA Interim Organic Storage Facility is located in the northeast portion of the B Plant Complex (Figure 2-2). The 276-BA Interim Organic Storage Facility consists of the secondary containment structure for two storage tanks (Figure 2-8).

The secondary containment structure is 9.4 meters long, 10.5 meters wide, and 0.6 meter high. The secondary containment structure is divided into two separate compartments, each holding one containerized storage tank. The secondary containment structure is lined for compatibility with the organic mixed waste in the tanks.

The two tanks in the 276-BA Interim Organic Storage Facility are part of the Organic Mixed Waste Storage System (Section 2.2.1.4).

2.2 B PLANT COMPLEX WASTE MANAGEMENT UNITS

There are three waste management units at B Plant Complex: waste treatment and/or storage in vessels, containerized waste storage, and storage in an containment building. This section gives a brief description of the individual components of these waste management units. The description is based on the Part A, Form 3, permit applications (Revision 5, dated October 1, 1996) for the B Plant Complex (DOE/RL-88-21).

2.2.1 Waste Treatment and/or Storage in Vessels

The largest waste management unit in the B Plant Complex is waste treatment and/or storage in vessels. This waste management unit can by divided into five separate vessel systems. A vessel system includes one or more treatment and/or storage vessel, its ancillary equipment, and its secondary containment. The five systems are as follows:

- Neutralized Current Acid Waste (NCAW) Storage and Treatment System
- Low-Level Waste (LLW) Storage and Treatment System
- LLW Concentrator
- Organic Mixed Waste Storage System
- Miscellaneous Tank Storage System.

The five systems include a total of 54 vessels. Tables 2-1 and 2-2 provide a summary of the vessel systems and individual vessels affected by this preclosure work plan. Figures 2-5, 2-6, 2-8, and 2-9 provide an overview of the vessels located in, respectively, the 221-BB Building, the

221-BF Facility, the 276-BA Facility, and the canyon process cells in the 221-B Building. Vessel nomenclature is discussed in Appendix A.

2.2.1.1 NCAW Storage and Treatment System. In the 221-B Building, the NCAW Storage and Treatment System is spread between six process cells and includes 10 vessel systems (Figure 2-9). The specifics of each vessel, location, physical characteristics, and ancillary equipment are presented on Tables 2-2 and 2-3.

2.2.1.2 LLW Storage and Treatment System. The LLW Storage and Treatment System is spread between six process cells in the 221-B Building and includes eight vessel systems (Figure 2-9). The specifics of each vessel, location, physical characteristics, and ancillary equipment are presented on Tables 2-2 and 2-3.

2.2.1.3 LLW Concentrator. The LLW Concentrator System is located in one process cell in the 221-B Building and includes six vessel systems (Figure 2-9). The specifics of each vessel, location, physical characteristics, and ancillary equipment are presented on Tables 2-2 and 2-3.

2.2.1.4 Organic Mixed Waste Storage System. The Organic Mixed Waste Storage System is spread between the 276-BA Interim Organic Storage Facility and five process cells in the 221-B Building. This system includes 10 vessel systems. Eight are located in the canyon process cells (Figure 2-9) and two are located externally (Figure 2-2) in the 276-BA Interim Organic Storage Facility. There are no physical connections among the external tanks and the process cells. The specifics of each vessel, location, physical characteristics, and ancillary equipment are presented in Tables 2-2 and 2-3.

2.2.1.5 Miscellaneous Tank Storage System. The Miscellaneous Tank Storage System is spread between 14 process cells in the 221-B Building (Figure 2-9), the 221-BB Process and Steam Condensate Building (Figure 2-2), and the 221-BF Process Condensate Effluent Discharge Building (Figure 2-2). A total of 20 vessel systems comprise the miscellaneous waste tanks. The specifics of each vessel, its location, physical characteristics, and ancillary equipment are presented on Tables 2-2 and 2-3.

2.2.1.6 Secondary Containment for the Vessel Systems. In the 221-B Building, an interconnected system is used as secondary containment for the canyon process cells and the hot pipe trench. The process cells act as the secondary containment for each vessel. The hot pipe trench acts as the secondary containment for the ancillary piping. The majority of the process cells are sloped toward the southeast corner of the cell. In that corner, a 152-millimeter vertical drain connects to the cell drain header. The cell drain header is a 610-millimeter vitrified clay pipe that drains into a collection tank (TK-10-1) in Cell 10. In addition to the cell drain header, the pipe trench floor drain header also feeds this central collection tank. The cell drain header and the hot pipe trench drain header run the length of the 221-B Building: 54.9 meters the east end of the building to Cell 10 and 182.9 meters from the west end of the building to Cell 10.

In the 221-BB Process and Steam Condensate Building, the condensate pit acts as the secondary containment for the two tanks. The same arrangement is used in the 221-BF Condensate Effluent Discharge Facility where the tank room acts as the secondary containment for the two tanks. In the 276-BA Interim Organic Storage Facility, the secondary containment is the structure. Individual containment areas are provided for each tank.

2.2.2 Cell 4 Containerized Waste Storage

The Cell 4 containerized waste storage unit is used for the storage of 208-liter containers of solid mixed waste, which do not contain free liquids. The design storage capacity of Cell 4 is 51.0 cubic meters. Cell 4 is 3.96 meters wide, 5.38 meters long, and 6.7 meters deep.

2.2.3 Containment Building

Areas within the B Plant canyon are used to store solid (liquid-free) mixed waste in the form of discarded process equipment. These areas are considered to be a 'containment building' subject to the requirements of 40 CFR 265, Subpart DD. These storage areas include the canyon deck and the process cells. The process design capacity of the containment building is 35,170 cubic meters. A qualified registered professional engineer certified that the 221-B Building meets the required design standards as specified in 40 CFR 265.1101(a) (ICF Kaiser 1996).

The solid mixed waste consists of radioactively contaminated failed canyon process equipment and jumpers (or isolated component thereof) containing lead used as weights, counterweights, or radiation shielding. The solid mixed waste might be contaminated with waste residues (Chapter 4.0, Section 4.1.4).

2.3 SECURITY INFORMATION

The Hanford Facility is a controlled-access area. The Hanford Facility maintains around-the-clock surveillance for the protection of government property, classified information, and special nuclear materials. The Hanford Patrol maintains a continuous presence of protective force personnel to provide additional security. All personnel accessing Hanford Facility areas must have a DOE-issued security identification badge indicating the appropriate authorization. Personnel also could be subject to a random search of items carried into or out of the Hanford Facility.

Hanford Facility personnel receive training on security regulations in the form of required security education and on-the-job training. Methods for ensuring personnel compliance with security requirements and provisions for security training are maintained on the Hanford Facility.

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B Plant Complex Site Plan

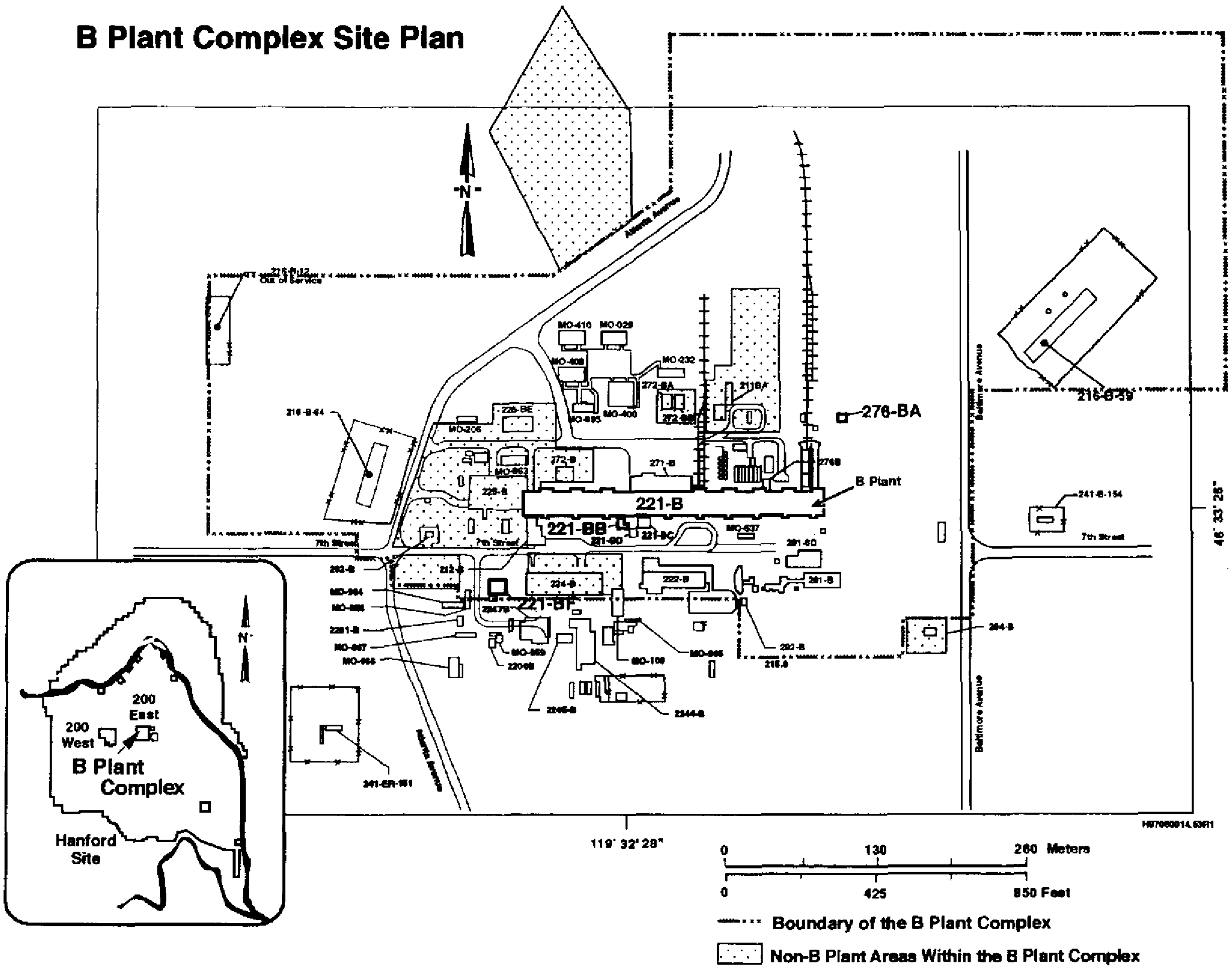

Figure 2-1. B Plant Complex.

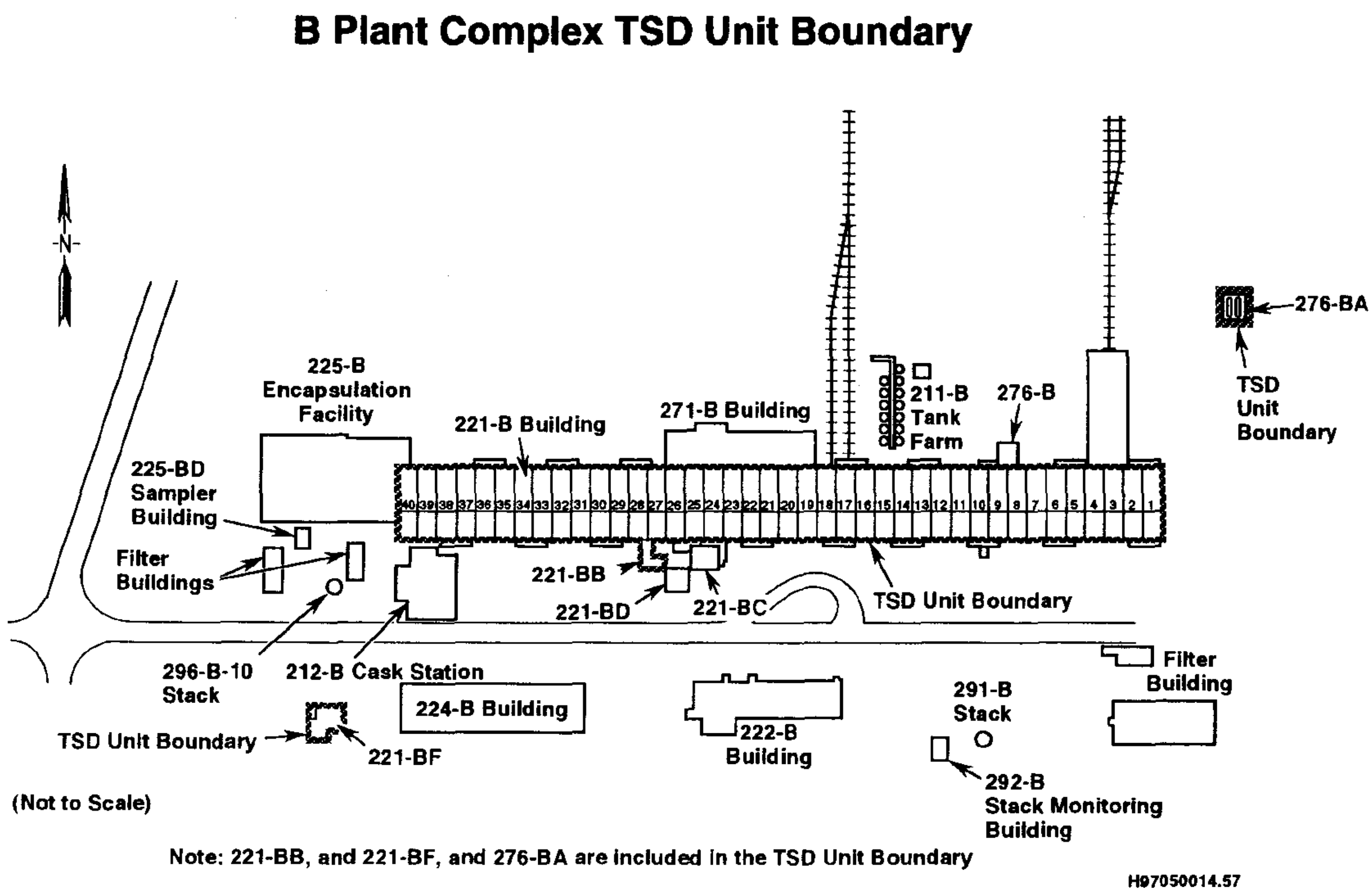

Figure 2-2. B Plant Complex TSD Unit Boundary.

221-B Building Cutaway (Typical)

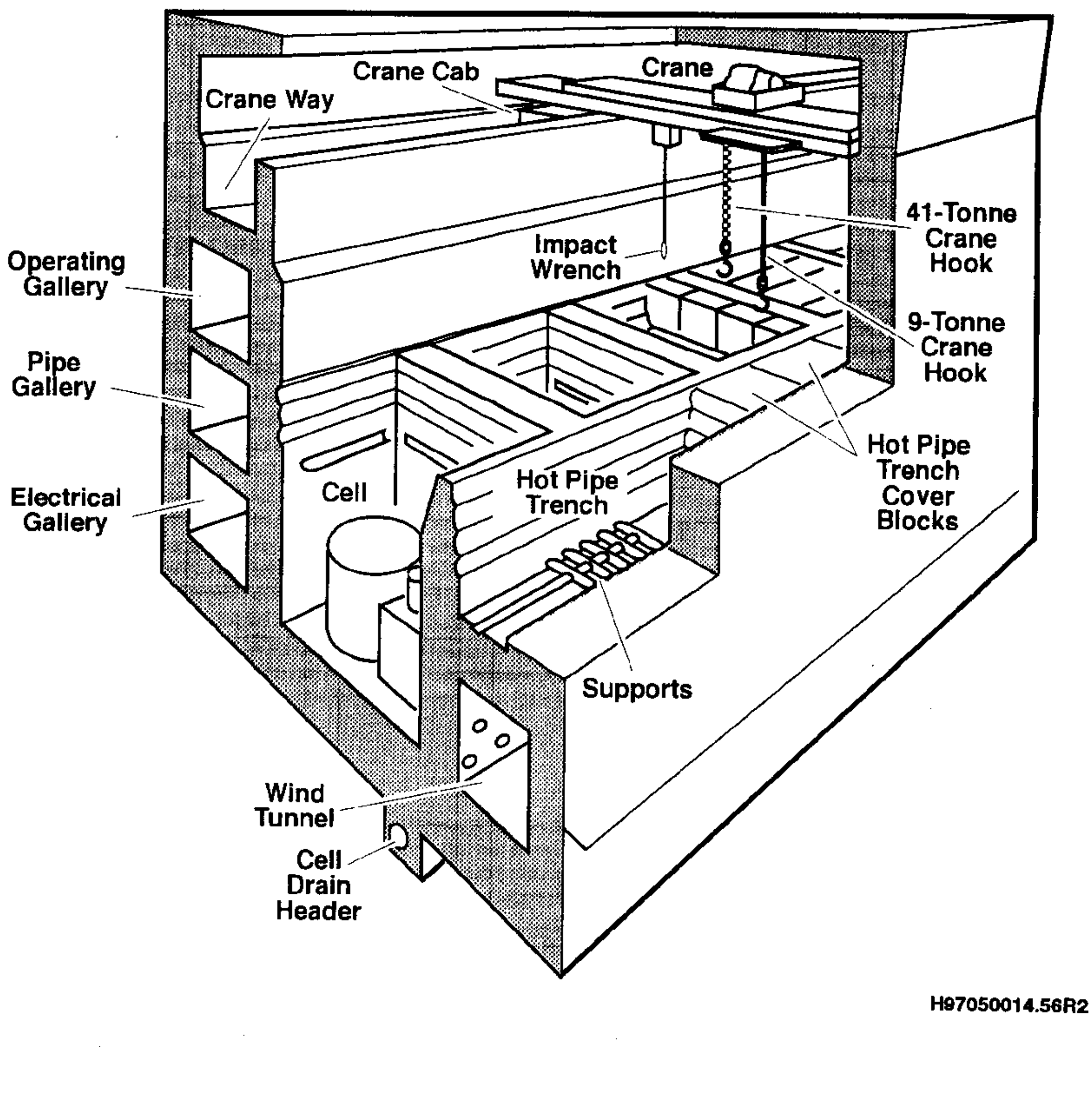

Figure 2-3. 221-B Building Cutwaway (typical).

221-B Building Cross-Section (Typical)

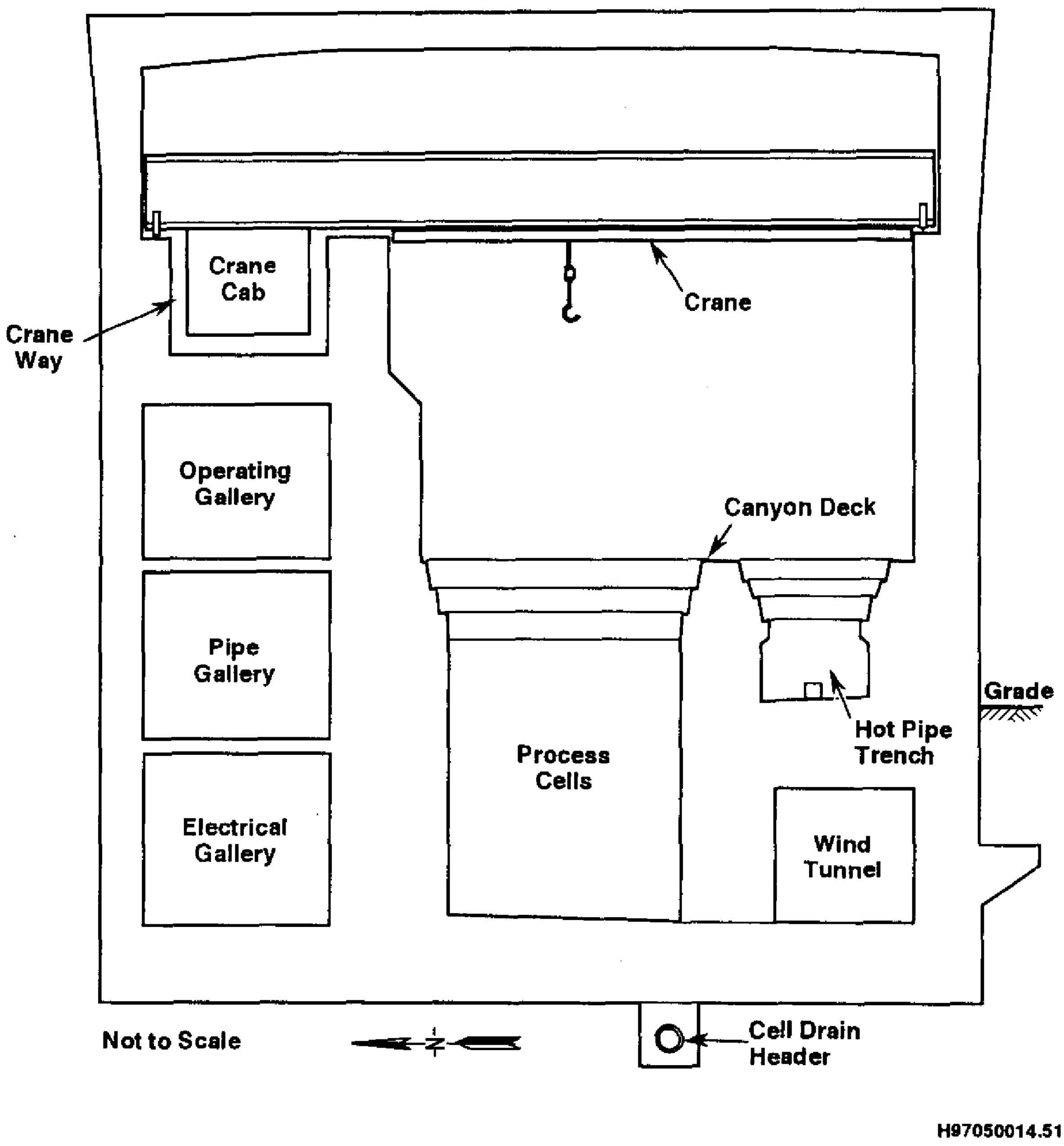

Figure 2-4. 221-B Building Cross-Section (typical).

221-BB Process and Steam Condensate Building

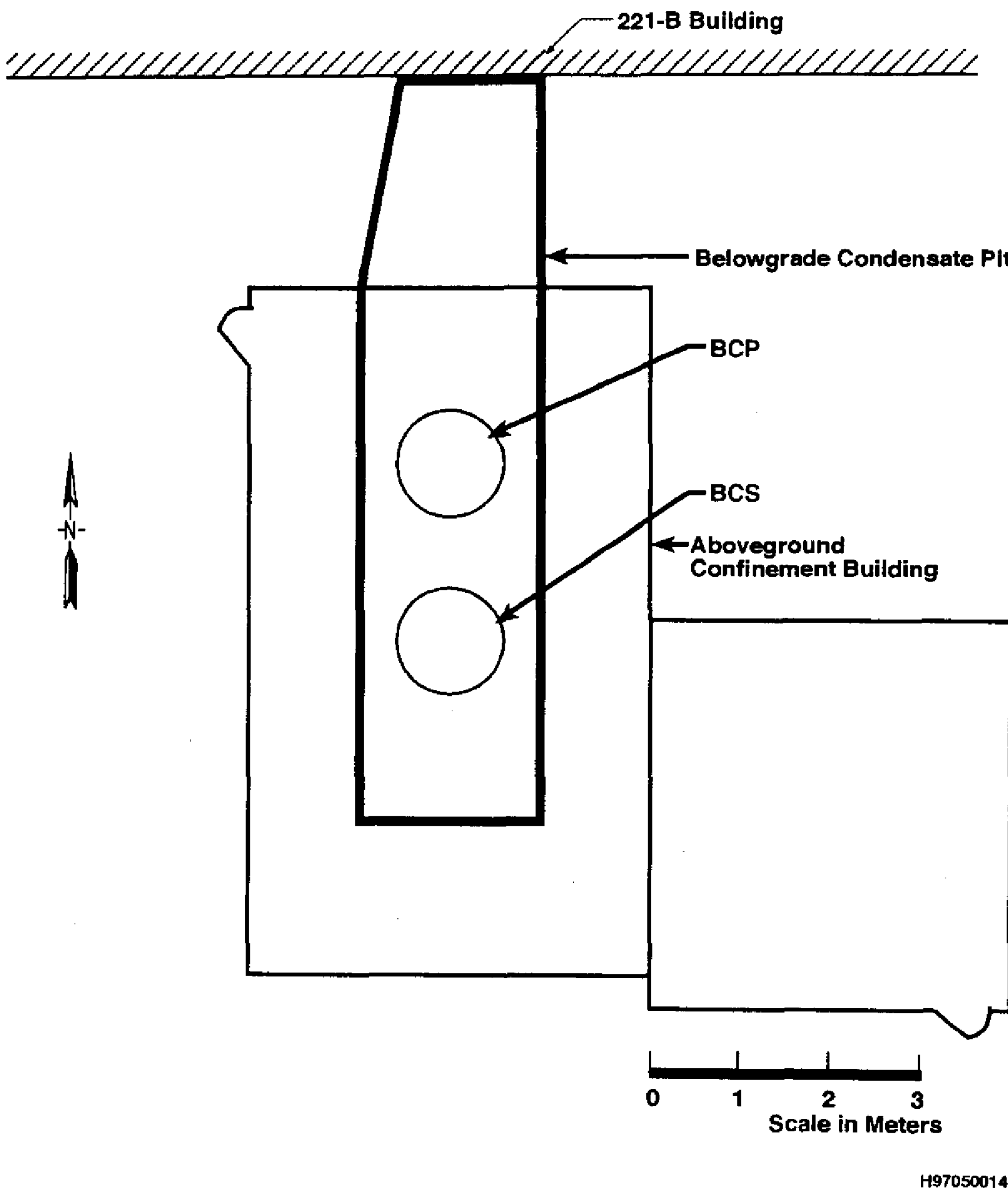

Figure 2-5. 221-BB Process and Steam Condensate Building.

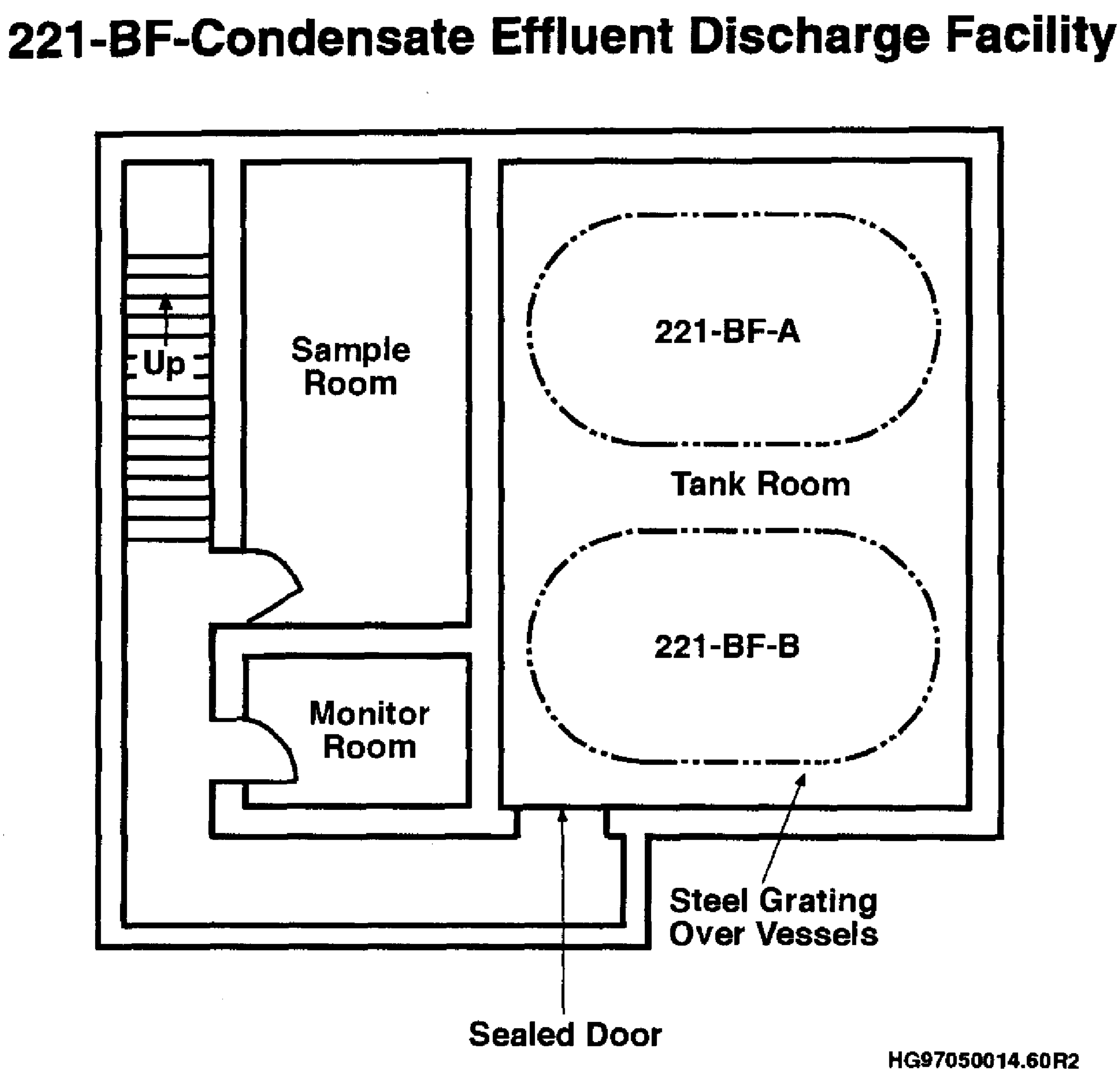

Figure 2-6. 221-BF Process Condensate Effluent Discharge Facility.

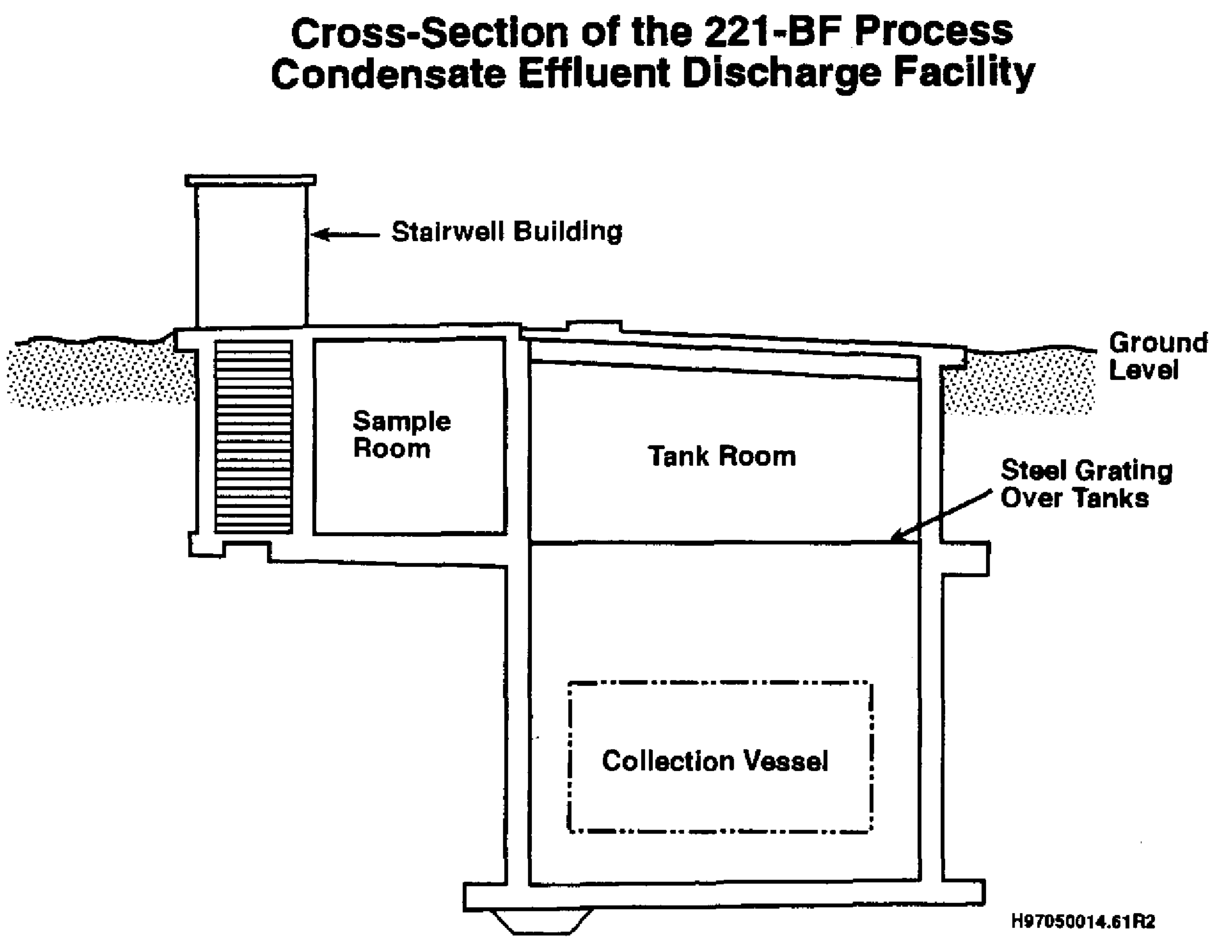

Figure 2-7. 221-BF Process Condensate Effluent Discharge Facility Cross-Section.

276-BA Interim Organic Storage Facility

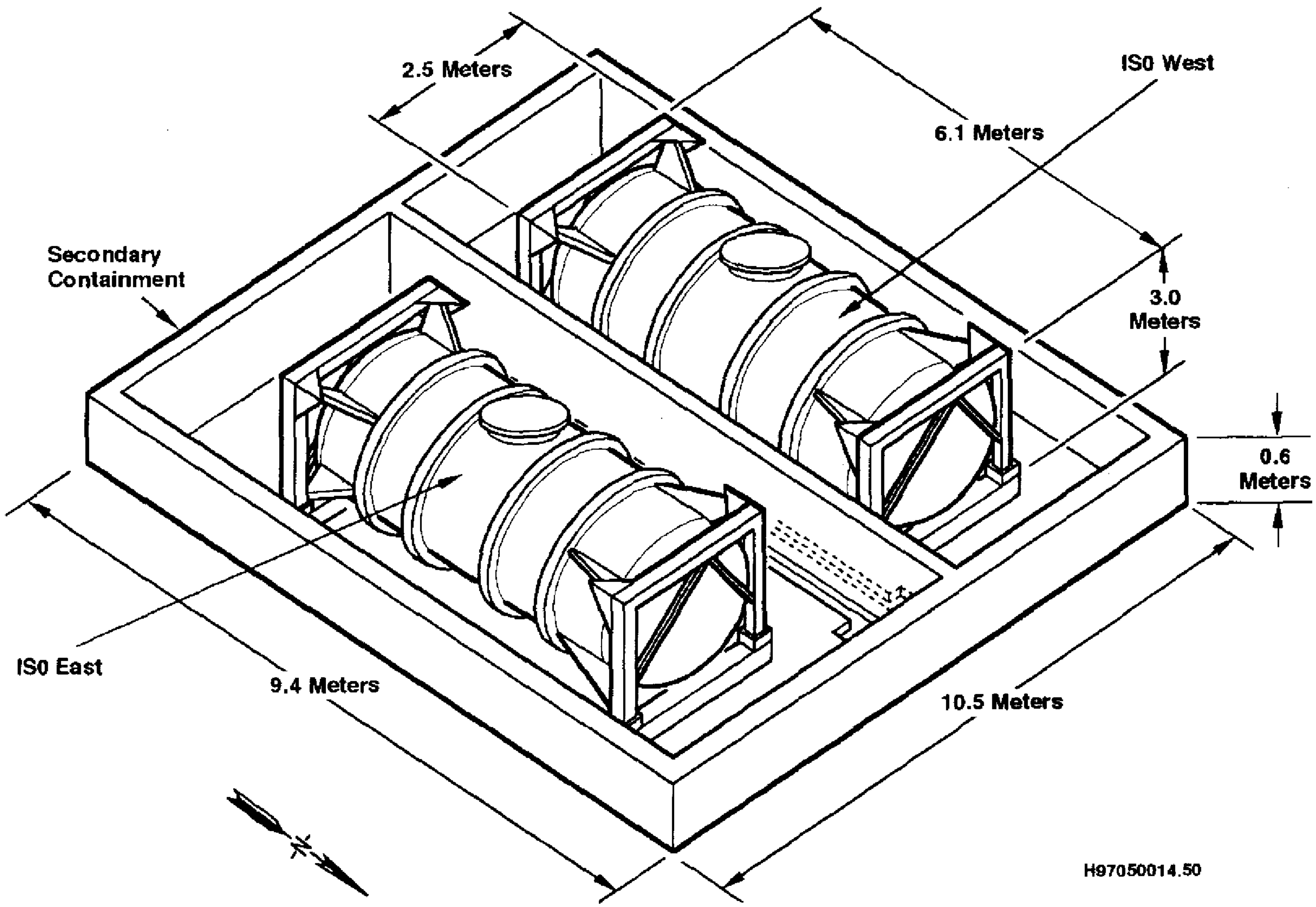

Figure 2-8. 276-BA Interim Organic Storage Facility.

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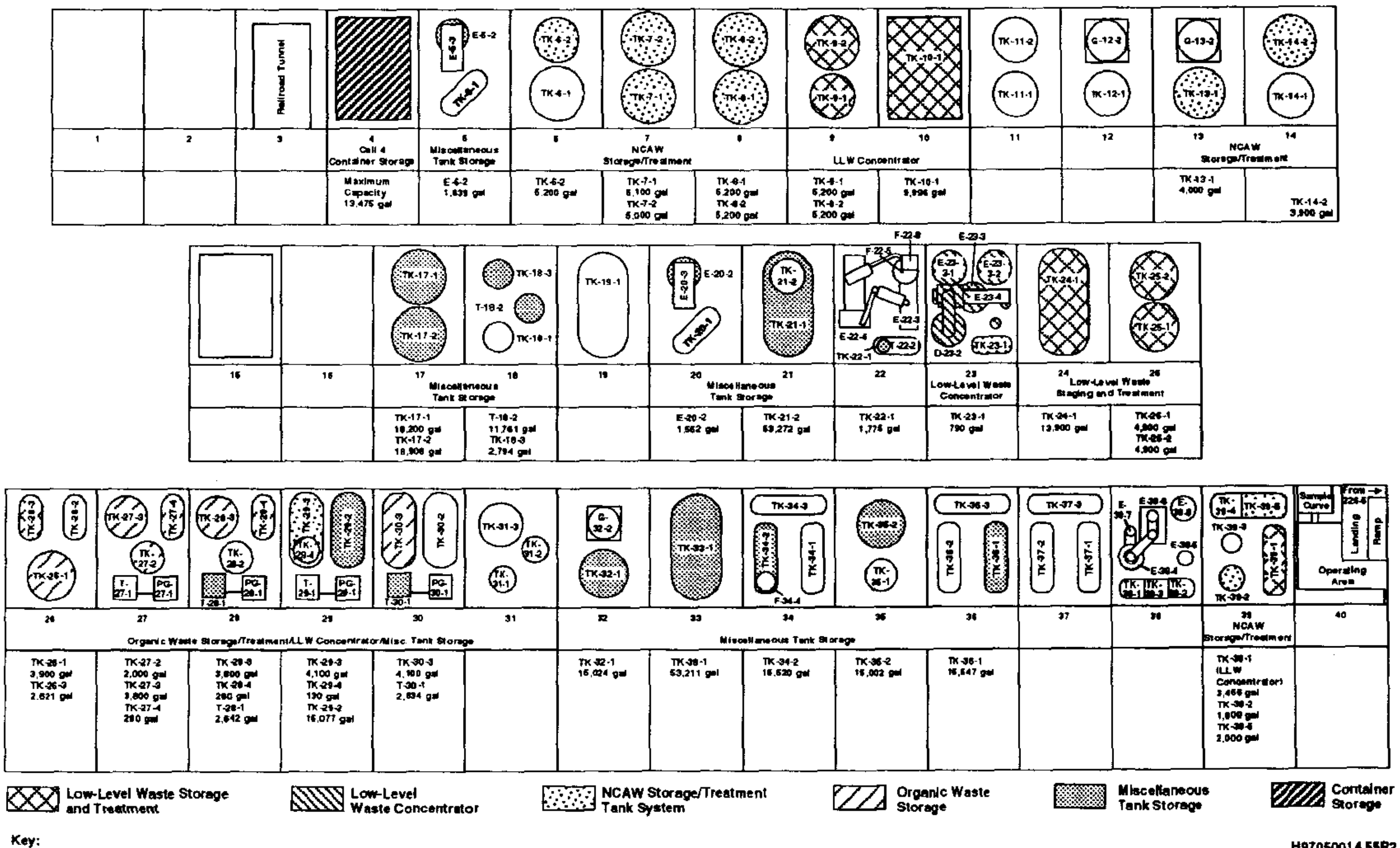
221-B Building Process Cells



Key:

NCAW = neutralized current acid waste	G = centrifuge
gal = gallon	P = pump
D = deentrainer	PG = pulse generator
E = heat transfer equipment	T = tower
F = filter	TK = tank

Note 1: For process cell configuration refer to B Plant Complex TSD Unit Boundary Figure 2-2.

Note 2: For conversion to liters, multiply gallons by 3.7854.

Figure 2-9. 221-B Building Process Cells.

Table 2-1. Treatment and/or Storage Vessels. (sheet 1 of 7)

Vessel	Vessel type	Location	TSD system	Process code
E-5-2	Heat transfer equipment	221-B Building, Cell 5	MISC	1,3
TK-6-2	Storage tank	221-B Building, Cell 6	NCAW	2
TK-7-1	Storage tank	221-B Building, Cell 7	NCAW	2
TK-7-2	Storage tank	221-B Building, Cell 7	NCAW	2
TK-8-1	Storage tank	221-B Building, Cell 8	NCAW	2
TK-8-2	Storage tank	221-B Building, Cell 8	NCAW	2
TK-9-1	Storage tank	221-B Building, Cell 9	LLW	7
TK-9-2	Storage tank	221-B Building, Cell 9	LLW	7
TK-10-1	Storage tank	221-B Building, Cell 10	LLW	7
TK-13-1	Storage tank	221-B Building, Cell 13	NCAW	2
TK-14-2	Storage tank	221-B Building, Cell 14	NCAW	2
TK-17-1	Storage tank	221-B Building, Cell 17	MISC	3
TK-17-2	Storage tank	221-B Building, Cell 17	MISC	3
T-18-2	Tower	221-B Building, Cell 18	MISC	3
TK-18-3	Storage tank	221-B Building, Cell 18	MISC	3
E-20-2	Heat transfer equipment	221-B Building, Cell 20	MISC	3

Table 2-1. Treatment and/or Storage Vessels. (sheet 2 of 7)

Vessel	Vessel type	Location	TSD system	Process code
TK-21-1	Storage tank	221-B Building, Cell 21	MISC	3
TK-22-1	Storage tank	221-B Building, Cell 22	MISC	4
TK-23-1	Storage tank	221-B Building, Cell 23	LLW CONC	6
E-23-3	Heat transfer equipment (concentrator)	221-B Building, Cell 23	LLW CONC	6
E-23-3-1	Heat transfer equipment (tube bundle)	221-B Building, Cell 23	LLW CONC	6
E-23-3-2	Heat transfer equipment (tube bundle)	221-B Building, Cell 23	LLW CONC	6
E-23-4	Heat transfer equipment (condenser)	221-B Building, Cell 23	LLW CONC	6
D-23-2	De-entrainer	221-B Building, Cell 23	LLW CONC	6
TK-24-1	Storage tank	221-B Building, Cell 24	LLW	7
TK-25-1	Storage tank	221-B Building, Cell 25	LLW	7
TK-25-2	Storage tank	221-B Building, Cell 25	LLW	7
TK-26-1	Storage tank	221-B Building, Cell 26	ORG	5
TK-26-3	Storage tank	221-B Building, Cell 26	LLW	7
TK-27-2	Storage tank	221-B Building, Cell 27	ORG	5
TK-27-3	Storage tank	221-B Building, Cell 27	ORG	5
TK-27-4	Storage tank	221-B Building, Cell 27	ORG	5

Table 2-1. Treatment and/or Storage Vessels. (sheet 3 of 7)

Vessel	Vessel type	Location	TSD system	Process code
T-28-1	Tower	221-B Cell 28	MISC	5
TK-28-3	Storage tank	221-B Building, Cell 28	ORG	5
TK-28-4	Storage tank	221-B Building, Cell 28	ORG	5
TK-29-2	Storage tank	221-B Building, Cell 29	MISC	5
TK-29-3	Storage tank	221-B Building, Cell 29	NCAW	5
TK-29-4	Storage tank	221-B Building, Cell 29	ORG	5
T-30-1	Tower	221-B Cell 30	MISC	59
TK-30-3	Storage tank	221-B Building, Cell 30	ORG	5
TK-32-1	Storage tank	221-B Building, Cell 32	MISC	1
TK-33-1	Storage tank	221-B Building, Cell 33	MISC	3
TK-34-2	Storage tank	221-B Building, Cell 34	MISC	3
TK-35-2	Storage tank	221-B Building, Cell 35	MISC	3
TK-36-1	Storage tank	221-B Building, Cell 36	MISC	3
TK-39-1	Storage tank	221-B Building, Cell 39	LLW	3
TK-39-2	Storage tank	221-B Building, Cell 39	NCAW	2
TK-39-5	Storage tank	221-B Building, Cell 39	NCAW	2

Table 2-1. Treatment and/or Storage Vessels. (sheet 4 of 7)

Vessel	Vessel type	Location	TSD system	Process code
BCP	Storage tank	221-BB Building, Condensate Pit	MISC	6
BCS	Storage tank	221-BB Building, Condensate Pit	MISC	6
221-BF-A	Storage tank	221-BF Facility Effluent Control Pit	MISC	6
221-BF-B	Storage tank	221-BF Facility, Effluent Control Pit	MISC	6
ISO West	Storage tank	276-BA Facility	ORG	5
ISO East	Storage tank	276-BA Facility	ORG	5

Table 2-1. Treatment and/or Storage Vessels. (sheet 5 of 7)

Process Codes/Legend			
Code	Process	Chemical Additions	Process Descriptions
1	Strontium purification		
	Sulfate precipitation	Na_2SO_4 (sodium sulfate) Na_2CO3 (sodium carbonate) NaOH (sodium hydroxide) HNO_3 (nitric acid) HEDTA (hydroxyethylene diamine triacetic acid)	Batch process to separate strontium from metallic ions except for sodium, barium, and rare earths via precipitation, metathesis, and dissolution.
	Caustic strike	NaOH HNO_3 HEDTA	Precipitation process to remove metallic impurities such as iron, magnesium, nickel, chromium, rare earths, aluminum, cadmium, zinc, manganese, and lead.
	Rare earth	$RE(NO_3)_3$ (rare earth nitrate) Na_2SO_4 HEDTA HNO_3 Na_2CO_3	Precipitation process with a rare earth carrier followed by metathesis then acid dissolution for strontium purification.
2	NCAW	DE (diatomaceous earth)	Separation and removal of transuranic bearing solids and high-heat radioisotopes by settling and filtration. This was a solid/liquid separation, no chemical additions were required.

Table 2-1. Treatment and/or Storage Vessels. (sheet 6 of 7)

Process Codes/Legend			
Code	Process	Chemical Additions	Process Descriptions
3	Cesium processing		
	Cesium clarification	NaOH HNO_3 HEDTA	Removal of cesium from solids by leaching and centrifugation in preparation for additional purification via ion exchange.
	Primary ion exchange	NaOH HEDTA HNO_3 NH_3 CO_2 Duolite resin	This is the second step in the cesium purification process. The process consists of the addition of a chelating agent to prevent precipitation of iron and aluminum impurities and subsequent cation removal of cesium, sodium, and potassium by ion exchange.
	Ion exchange purification	NaOH NH_3 CO_2 Zeolite resin	Final purification of cesium. Cesium carbonate was produced, which was suitable for the encapsulation process via ion exchange for cation removal.
4	Vessel vent system	Scale inhibitor Dearborn 874*	Buildup of carbonate solids at discharge point of the vessel vent number 2 line required the addition of a scale inhibitor to prevent line pluggage.

Table 2-1. Treatment and/or Storage Vessels. (sheet 7 of 7)

Process Codes/Legend			
Code	Process	Chemical Additions	Process Descriptions
5	Strontium recovery, (solvent extraction)	NaOH Na_2CO_3 $NaC_6O_7H_4$ (Sodium gluconate) HNO_3 HEDTA EDTA (Ethylenediamine tetraacetic acid) Citric acid ACOH (hydroxyacetic acetic acid) TBP (tributylphosphate) HDEHP (Di2ethylhexylphosphoic acid) NPH (normal paraffin hydrocarbon)	Strontium is purified through a series of solvent extraction columns, then scrubbed and concentrated for encapsulation as strontium fluoride at WESF. The rare earth elements and calcium impurities are stripped from the organic stream and routed to DST System.
6	Evaporator/De-entrainer	NaOH HNO_3 Citric acid	The purpose of the waste concentration process is to collect, blend, and neutralize process waste for volume reduction, and ammonia separation for waste transmittal to DST System.
7	Waste handling	NaOH $NaNO_2$ (sodium nitrite)	All waste sent to underground storage is required to meet Ph and NO_2 limits for DST System corrosion and compatibility.

TK-xx-xx	Tank
T-xx-xx	Tower
E-xx-xx	Heat transfer equipment
D-xx-xx	De-entrainer
DST System	Double-Shell Tank System
MISC	Miscellaneous Tank Storage
NCAW	NCAW Storage and Treatment System
LLW	Low-Level Waste Storage and Treatment System
LLW CONC	Low-Level Waste Concentrator
ORG	Organic Mixed Waste Storage System
WESF	Waste Encapsulation and Storage Facility

*Dearborn 874 is a trademark of Dearborne Division of W.R. Grace & Co., Lake Zurick, Ill.

Table 2-2. Vessels by Treatment and/or Storage System. (sheet 1 of 7)

Vessel	Vessel Type	Location	Process Code
NCAW Storage and Treatment System			
TK-6-2	Storage tank	221-B Building, Cell 6	2
TK-7-1	Storage tank	221-B Building, Cell 7	2
TK-7-2	Storage tank	221-B Building, Cell 7	2
TK-8-1	Storage tank	221-B Building, Cell 8	2
TK-8-2	Storage tank	221-B Building, Cell 8	2
TK-13-1	Storage tank	221-B Building, Cell 13	2
TK-14-2	Storage tank	221-B Building, Cell 14	2
TK-29-3	Storage tank	221-B Building, Cell 29	5
TK-39-2	Storage tank	221-B Building, Cell 39	2
TK-39-5	Storage tank	221-B Building, Cell 39	2
LLW Storage and Treatment System			
TK-9-1	Storage tank	221-B Building, Cell 9	7
TK-9-2	Storage tank	221-B Building, Cell 9	7
TK-10-1	Storage tank	221-B Building, Cell 10	7
TK-24-1	Storage tank	221-B Building, Cell 24	7
TK-25-1	Storage tank	221-B Building, Cell 25	7
TK-25-2	Storage tank	221-B Building, Cell 25	7

Table 2-2. Vessels by Treatment and/or Storage System. (sheet 2 of 7)

Vessel	Vessel Type	Location	Process Code
TK-26-3	Storage tank	221-B Building, Cell 26	7
TK-39-1	Storage tank	221-B Building, Cell 39	3
LLW Concentrator			
TK-23-1	Storage tank	221-B Building, Cell 23	6
E-23-3	Heat transfer equipment (concentrator)	221-B Building, Cell 23	6
E-23-3-1	Heat transfer equipment (tube bundle)	221-B Building, Cell 23	6
E-23-3-2	Heat transfer equipment (tube bundle)	221-B Building, Cell 23	6
E-23-4	Heat transfer equipment (condenser)	221-B Building, Cell 23	6
D-23-2	De-entrainer	221-B Building, Cell 23	6
Organic Waste Storage System			
TK-26-1	Storage tank	221-B Building, Cell 26	5
TK-27-2	Storage tank	221-B Building, Cell 27	5
TK-27-3	Storage tank	221-B Building, Cell 27	5
TK-27-4	Storage tank	221-B Building, Cell 27	5
TK-28-3	Storage tank	221-B Building, Cell 28	5
TK-28-4	Storage tank	221-B Building, Cell 28	5
TK-29-4	Storage tank	221-B Building, Cell 29	5

Table 2-2. Vessels by Treatment and/or Storage System. (sheet 3 of 7)

Vessel	Vessel Type	Location	Process Code
TK-30-3	Storage tank	221-B Building, Cell 30	5
ISO West	Storage tank	276-BA Facility	5
ISO East	Storage tank	276-BA Facility	5
Miscellaneous Tank Storage			
E-5-2	Heat transfer equipment	221-B Building, Cell 5	1,3
TK-17-1	Storage tank	221-B Building, Cell 17	3
TK-17-2	Storage tank	221-B Building, Cell 17	3
T-18-2	Tower	221-B Building, Cell 18	3
TK-18-3	Storage tank	221-B Building, Cell 18	3
E-20-2	Heat transfer equipment	221-B Building, Cell 20	3
TK-21-1	Storage tank	221-B Building, Cell 21	3
TK-22-1	Storage tank	221-B Building, Cell 22	4
T-28-1	Tower	221-B Building, Cell 28	5
TK-29-2	Storage tank	221-B Building, Cell 29	5
T-30-1	Tower	221-B Building, Cell 30	5
TK-32-1	Storage tank	221-B Building, Cell 32	1
TK-33-1	Storage tank	221-B Building, Cell 33	3
TK-34-2	Storage tank	221-B Building, Cell 34	3

Table 2-2. Vessels by Treatment and/or Storage System. (sheet 4 of 7)

Vessel	Vessel Type	Location	Process Code
TK-35-2	Storage tank	221-B Building, Cell 35	3
TK-36-1	Storage tank	221-B Building, Cell 36	3
BCP	Storage tank	221-BB Building, Condensate Pit	6
BCS	Storage tank	221-BB Building, Condensate Pit	6
221-BF-A	Storage tank	221-BF Facility, Effluent Control Pit	6
221-BF-B	Storage tank	221-BF Facility, Effluent Control Pit	6

Table 2-2. Vessels by Treatment and/or Storage System. (sheet 5 of 7)

Process Codes/Legend			
Code	Process	Chemical Additions	Process Descriptions
1	Strontium purification		
	Sulfate precipitation	Na_2SO_4 (sodium sulfate) Na_2CO3 (sodium carbonate) NaOH (sodium hydroxide) HNO_3 (nitric acid) HEDTA (hydroxyethylene diamine triacetic acid)	Batch process to separate strontium from metallic ions except for sodium, barium, and rare earths via precipitation, metathesis, and dissolution.
	Caustic strike	NaOH HNO_3 HEDTA	Precipitation process to remove metallic impurities such as iron, magnesium, nickel, chromium, rare earths, aluminum, cadmium, zinc, manganese, and lead.
	Rare earth	$RE(NO_3)_3$ (rare earth nitrate) Na_2SO_4 HEDTA HNO_3 Na_2CO_3	Precipitation process with a rare earth carrier followed by metathesis then acid dissolution for strontium purification.
2	NCAW	DE (diatomaceous earth)	Separation and removal of transuranic bearing solids and high-heat radioisotopes by settling and filtration. This was a solid/liquid separation, no chemical additions were required.

Table 2-2. Vessels by Treatment and/or Storage System. (sheet 6 of 7)

Process Codes/Legend			
Code	Process	Chemical Additions	Process Descriptions
3	Cesium processing		
	Cesium clarification	NaOH HNO_3 HEDTA	Removal of cesium from solids by leaching and centrifugation in preparation for additional purification via ion exchange.
	Primary ion exchange	NaOH HEDTA HNO_3 NH_3 CO_2 Duolite resin	This is the second step in the cesium purification process. The process consists of the addition of a chelating agent to prevent precipitation of iron and aluminum impurities and subsequent cation removal of cesium, sodium, and potassium by ion exchange.
	Ion exchange purification	NaOH NH_3 CO_2 Zeolite resin	Final purification of cesium. Cesium carbonate was produced, which was suitable for the encapsulation process via ion exchange for cation removal.
4	Vessel vent system	Scale inhibitor Dearborn 874*	Buildup of carbonate solids at discharge point of the vessel vent number 2 line required the addition of a scale inhibitor to prevent line pluggage.

Table 2-2. Vessels by Treatment and/or Storage System. (sheet 7 of 7)

Process Codes/Legend			
Code	Process	Chemical Additions	Process Descriptions
5	Strontium recovery, (solvent extraction)	NaOH Na_2CO_3 $NaC_6O_7H_4$ (sodium gluconate) HNO_3 HEDTA EDTA (ethylenediamine tetraacetic acid) Citric acid ACOH (hydroxyacetic acetic acid) TBP (tributylphosphate) HDEHP (Di2ethylhexylphosphoic acid) NPH (normal paraffin hydrocarbon)	Strontium is purified through a series of solvent extraction columns, then scrubbed and concentrated for encapsulation as strontium fluoride at WESF. The rare earth elements and calcium impurities are stripped from the organic stream and routed to DST System.
6	Evaporator/De-entrainer	NaOH HNO_3 Citric acid	The purpose of the waste concentration process is to collect, blend, and neutralize process waste for volume reduction, and ammonia separation for waste transmittal to DST System.
7	Waste handling	NaOH $NaNO_2$ (sodium nitrite)	All waste sent to underground storage is required to meet pH and NO_2 limits for DST System corrosion and compatibility.

TK-xx-xx	Tank
T-xx-xx	Tower
E-xx-xx	Heat transfer equipment
D-xx-xx	De-entrainer
DST System	Double-Shell Tank System
WESF	Waste Encapsulation and Storage Facility

*Dearborn 874 is a trademark of Dearborne Division of W.R. Grace & Co., Lake Zurick, Ill.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment.
(sheet 1 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 5, 221-B Building	E-5-2	MISC	<u>Characteristics:</u> Shape: cylindrical with pipe connections on one side, height 6.40 meters overall, maximum diameter 1.37 meters. Material of construction: stainless steel. Capacity: 6,204 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 5	MISC	<u>General ancillary equipment</u> • Hot pipe trench piping between Cell 5 and the other cells. • Transfer piping between Cell 5 and 221-BB Building. • Secondary containment for E-5-2.
Cell 6, 221-B Building	TK-6-2	NCAW	<u>Characteristics:</u> Shape: cylindrical, height 4.27 meters, diameter 2.44 meters. Material of construction: stainless steel. Capacity: 19,684 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 6	NCAW	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 6 and the other cells. • Secondary containment for TK-6-2.
Cell 7, 221-B Building	TK-7-1	NCAW	<u>Characteristics</u>: Shape: cylindrical, height 4.27 meters, diameter 2.44 meters. Material of construction: stainless steel. Capacity: 19,306 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment. (sheet 2 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 7, 221-B Building (cont)	TK-7-2	NCAW	<u>Characteristics</u>: Shape: cylindrical, height 4.27 meters, diameter 2.44 meters. Material of construction: stainless steel. Capacity: 18,927 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 7	NCAW	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 7 and the other cells. • Secondary containment for TK-7-1 and TK-7-2.
Cell 8, 221-B Building	TK-8-1	NCAW	<u>Characteristics</u>: Shape: cylindrical, height 4.27 meters, diameter 2.44 meters. Material of construction: stainless steel. Capacity: 18,684 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	TK-8-2	NCAW	<u>Characteristics</u>: Shape: cylindrical, height 4.27 meters, diameter 2.44 meters. Material of construction: stainless steel. Capacity: 18,684 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 8	NCAW	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 8 and the other cells. • Secondary containment for TK-8-1 and TK-8-2.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment.
(sheet 3 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 9, 221-B Building	TK-9-1	LLW	<u>Characteristics</u>: Shape: cylindrical, height 4.27 meters, diameter 2.44 meters. Material of construction: stainless steel. Capacity: 19,684 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	TK-9-2	LLW	<u>Characteristics</u>: Shape: cylindrical, height 4.27 meters, diameter 2.44 meters. Material of construction: stainless steel. Capacity: 19,684 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 9	LLW	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 9 and the other cells. • Transfer piping between Cell 9 and the 154-BX-U5 diversion box. • Secondary containment for TK-9-1 and TK-9-2.
Cell 10, 221-B Building	TK-10-1	LLW	<u>Characteristics</u>: Shape: rectangular, height 2.13 meters, length 5.49 meters, width 3.35 meters. Material of construction: stainless steel. Capacity: 37,839 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 10	LLW	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 10 and the other cells. • Transfer piping between Cell 10 and the 216-B-39 Trench and Retention Basin. • Secondary containment for TK-10-1.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment. (sheet 4 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 13, 221-B Building	TK-13-1	NCAW	<u>Characteristics</u>: Shape: cylindrical, height 2.74 meters, diameter 2.74 meters. Material of construction: stainless steel. Capacity: 14,812 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 13	NCAW	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 13 and the other cells. • Secondary containment for TK-10-1.
Cell 14, 221-B Building	TK-14-2	NCAW	<u>Characteristics</u>: Shape: cylindrical, height 2.74 meters, diameter 2.74 meters. Material of construction: stainless steel. Capacity: 14,763 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 14	NCAW	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 14 and the other cells. • Secondary containment for TK-14-2.
Cell 17, 221-B Building	TK-17-1	MISC	<u>Characteristics</u>: Shape: cylindrical, height 4.27 meters, diameter 2.44 meters. Material of construction: stainless steel. Capacity: 68,894 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment. (sheet 5 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 17, 221-B Building (cont)	TK-17-2	MISC	<u>Characteristics</u>: Shape: cylindrical, height 4.27 meters, diameter 2.44 meters. Material of construction: stainless steel. Capacity: 71,574 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 17	MISC	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 17 and the other cells. • Secondary containment for TK-17-1 and TK-17-2.
Cell 18, 221-B Building	T-18-2	MISC	<u>Characteristics</u>: Shape: cylindrical, height 4.57 meters, diameter 1.83 meters. Material of construction: stainless steel. Capacity: 44,634 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	TK-18-3	MISC	<u>Characteristics</u>: Shape: cylindrical, height 2.13 meters, diameter 1.37 meters. Material of construction: stainless steel. Capacity: 10,576 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.

	Cell 18	MISC	<u>General ancillary equipment</u>:
			• Hot pipe trench piping between Cell 18 and the other cells.
			• Transfer piping between Cell 18 and:
			  - 244-B Building
			  - 241-BX-154-U8 diversion box.
			• Secondary containment for T-18-2 and TK-18-3.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment. (sheet 6 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 20, 221-B Building	E-20-2	MISC	Characteristics: Shape: cylindrical with pipe connections on one side, height 6.40 meters overall, maximum diameter 1.37 meters. Material of construction: stainless steel. Capacity: 5,875 liters. Specific ancillary equipment: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 20	MISC	General ancillary equipment: • Hot pipe trench piping between Cell 20 and the other cells. • Secondary containment for E-20-2.
Cell 21, 221-B Building	TK-21-1	MISC	Characteristics: Shape: oval, height 4.27 meters, length 4.88 meters, width 3.05 meters. Material of construction: stainless steel. Capacity: 201,656 liters. Specific ancillary equipment: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 21	MISC	General ancillary equipment: • Hot pipe trench piping between Cell 21 and the other cells. • Transfer piping between Cell 21 and the 154-BX-U2 diversion box. • Secondary containment for TK-21-1.
Cell 22, 221-B Building	TK-22-1	MISC	Characteristics: Shape: oval, height 1.22 meters, length 2.13 meters, width 0.99 meters. Material of construction: stainless steel. Capacity: 6,719 liters. Specific ancillary equipment: Various jumpers that lead from vessel to the connections on the cell walls.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment.
(sheet 7 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 22, 221-B Building (cont)	Cell 22	MISC	General ancillary equipment: • Hot pipe trench piping between Cell 22 and the other cells. • Transfer piping between Cell 22 and BCP. • Secondary containment for TK-22-1.
Cell 23, 221-B Building	TK-23-1	LLW Conc	Characteristics: Shape: oval, height 1.98 meters, length 1.83 meters, width 1.22 meters. Material of construction: stainless steel. Capacity: 2,990 liters. Specific ancillary equipment: • Various jumpers that lead from vessel to the connections on the cell walls. • Various jumpers between vessel and E-23-3.
	E-23-3	LLW Conc	Characteristics: Shape: basically cylindrical, overall height 4.88 meters, overall diameter 1.52 meters. Material of construction: stainless steel. Capacity: 11,356 liters. Specific ancillary equipment • Various jumpers that lead from vessel to the connections on the cell walls. • Various jumpers between vessel and: - TK-23-1 - D-23-2. • Process interconnection between vessel and: - E-23-3-1 - E-23-3-2 - D-23-2.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment.
(sheet 8 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 23, 221-B Building (cont)	E-23-3-1	LLW Conc	<u>Characteristics</u>: Shape: basically cylindrical, overall height 4.66 meters, overall diameter 1.40 meters. Material of construction: stainless steel. Capacity: 0 liters. <u>Specific ancillary equipment</u>: • Various jumpers that lead from vessel to the connections on the cell walls. • Process interconnection between vessel and E-23-3.
	E-23-3-2	LLW Conc	<u>CHARACTERISTICS</u>: Shape: basically cylindrical, overall height 4.66 meters, overall diameter 1.40 meters. Material of construction: stainless steel. Capacity: 0 liters. <u>Specific ancillary equipment</u>: • Various jumpers that lead from vessel to the connections on the cell walls. • Process interconnection between vessel and E-23-3.
	E-23-4	LLW Conc	<u>Characteristics</u>: Shape: basically cylindrical with large number of additional pipes, overall length 3.66 meters, overall height 1.83 meters. Material of construction: stainless steel. Capacity: 0 liters. <u>Specific ancillary equipment</u>: • Various jumpers that lead from vessel to the connections on the cell walls. • Process interconnection between vessel and D-23-2.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment. (sheet 9 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 23, 221-B Building (cont)	D-23-2	LLW Conc	<u>Characteristics</u>: Shape: cylindrical, height 2.13 meters overall, diameter 1.52 meters. Material of construction: stainless steel. Capacity: 0 liters. <u>Specific ancillary equipment</u>: • Various jumpers that lead from vessel to the connections on the cell walls. • Various jumpers between vessel and E-23-3. • Process interconnection between vessel and - E-23-3 - E-23-4.
	Cell 23	LLW Conc	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 23 and the other cells. • Transfer piping between Cell 23 and - the 154-B-U4 diversion box - BCS. • Secondary containment for TK-23-1, E-23-3, E-23-4, and D-23-2.
Cell 24, 221-B Building	TK-24-1	LLW	<u>Characteristics</u>: Shape: oval, height 4.27 meters, length 4.88 meters, width 3.06 meters. Material of construction: stainless steel. Capacity: 52,614 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment.
(sheet 10 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment

Cell 24, 221-B Building (cont)	Cell 24	LLW	<u>General ancillary equipment</u>:
			• Hot pipe trench piping between Cell 24 and the other cells.
			• Transfer piping between Cell 24 and
			  - the Tank Farms
			  - BCS
			  - the 221-BB Building Condensate Pit.
			• Secondary containment for TK-24-1.

Cell 25, 221-B Building	TK-25-1	LLW	<u>Characteristics</u>: Shape: cylindrical, height 4.27 meters, diameter 2.44 meters. Material of construction: stainless steel. Capacity: 18,548 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	TK-25-2	LLW	<u>Characteristics</u>: Shape: cylindrical, height 4.27 meters, diameter 2.44 meters. Material of construction: stainless steel. Capacity: 18,548 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 25	LLW	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 25 and the other cells. • Transfer piping between Cell 25 and the 244-AR Vault. • Secondary containment for TK-25-1 and TK-25-2.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment.
(sheet 11 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 26, 221-B Building	TK-26-1	ORG	Characteristics: Shape: cylindrical, height 2.74 meters, diameter 2.74 meters. Material of construction: stainless steel. Capacity: 14,763 liters. Specific ancillary equipment: Various jumpers that lead from vessel to the connections on the cell walls.
	TK-26-3	LLW	Characteristics: Shape: oval, height 3.81 meters, length 2.13 meters, width 1.52 meters. Material of construction: stainless steel. Capacity: 9,922 liters. Specific ancillary equipment: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 26	ORG and LLW	General ancillary equipment: • Hot pipe trench piping between Cell 26 and the other cells. • Transfer piping between Cell 26 and the 154-B-U3 diversion box. • Secondary containment for TK-26-1 and TK-26-3.
Cell 27, 221-B Building	TK-27-2	ORG	Characteristics: Shape: cylindrical, height 3.66 meters, diameter 1.52 meters. Material of construction: stainless steel. Capacity: 7,571 liters. Specific ancillary equipment: Various jumpers that lead from vessel to the connections on the cell walls.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment. (sheet 12 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 27, 221-B Building (cont)	TK-27-3	ORG	<u>Characteristics</u>: Shape: oval, height 3.81 meters, length 2.13 meters, 1.52 meters. Material of construction: stainless steel. Capacity: 14,385 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	TK-27-4	ORG	<u>Characteristics</u>: Shape: oval, height 1.07 meters, length 1.52 meters, 2.75 meters. Material of construction: stainless steel. Capacity: 1,022 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 27	ORG	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 27 and the other cells. • Secondary containment for TK-27-2, TK-27-3, and TK-27-4.
Cell 28, 221-B Building	T-28-1	MISC	<u>Characteristics</u>: Shape: roughly cylindrical, height overall 5.94 meters; rectangular footprint 1.22 meters wide and 1.52 meters long; tower also consists of a cylinder with a diameter of about 0.30 meters and a height of about 4.88 meters. Material of construction: stainless steel. Capacity: 10,001 liters. <u>Specific ancillary equipment</u>: • Various jumpers that lead from vessel to the connections on the cell walls. • PG-28-1 (pulse generator for T-28-1).

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment.
(sheet 13 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 28, 221-B Building (cont)	TK-28-3	ORG	<u>Characteristics</u>: Shape: cylindrical, height 4.27 meters, diameter 2.13 meters. Material of construction: stainless steel. Capacity: 14,385 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	TK-28-4	ORG	<u>Characteristics</u>: Shape: oval, height 1.07 meters, length 1.52 meters, 2.75 meters. Material of construction: stainless steel. Capacity: 1,060 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 28	MISC and ORG	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 28 and the other cells. • Transfer piping between Cell 28 and the 154-BX-U3 diversion box. • Secondary containment for T-28-1, TK-28-3, and TK-28-4.
Cell 29, 221-B Building	TK-29-2	MISC	<u>Characteristics</u>: Shape: oval, height 4.27 meters, length 2.90 meters, width 1.52 meters. Material of construction: stainless steel. Capacity: 57,072 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment. (sheet 14 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 29, 221-B Building (cont)	TK-29-3	NCAW	<u>Characteristics</u>: Shape: oval, height 4.27 meters, length 2.90 meters, width 1.52 meters. Material of construction: stainless steel. Capacity: 15,520 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	TK-29-4	ORG	<u>Characteristics</u>: Shape: cylindrical, height 2.64 meters, diameter 0.51 meters. Material of construction: stainless steel. Capacity: 492 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 29	MISC, ORG, and NCAW	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 29 and the other cells. • Transfer piping between Cell 29 and the 154-BX-U7 diversion box. • Secondary containment for TK-29-2, TK-29-3, and TK-29-4.
Cell 30, 221-B Building	T-30-1	MISC	<u>Characteristics</u>: Shape: roughly cylindrical, height overall 5.94 meters; rectangular footprint 1.22 meters wide and 1.52 meters long; tower also consists of a cylinder with a diameter of about 0.30 meters and a height of about 4.88 meters. Material of construction: stainless steel. Capacity: 9,971 liters. <u>Specific ancillary equipment</u>: • Various jumpers that lead from vessel to the connections on the cell walls. • PG-30-1 (pulse generator for T-30-1).

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment.
(sheet 15 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 30, 221-B Building (cont)	TK-30-3	ORG	<u>Characteristics</u>: Shape: oval, height 4.27 meters, length 2.90 meters, 1.52 meters. Material of construction: stainless steel. Capacity: 15,520 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 30	MISC and ORG	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 30 and the other cells. • Secondary containment for T-30-1 and TK-30-3.
Cell 32, 221-B Building	TK-32-1	MISC	<u>Characteristics</u>: Shape: cylindrical, height 2.74 meters, diameter 2.74 meters. Material of construction: stainless steel. Capacity: 15,024 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 32	MISC	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 32 and the other cells. • Secondary containment for TK-32-1.
Cell 33, 221-B Building	TK-33-1	MISC	<u>Characteristics</u>: Shape: oval, height 4.27 meters, length 4.88 meters, width 3.05 meters. Material of construction: stainless steel. Capacity: 201,425 lites. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment.
(sheet 16 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 33, 221-B Building (cont)	Cell 33	MISC	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 33 and the other cells. • Transfer piping between Cell 33 and the 224-B Building. • Secondary containment for TK-33-1.
Cell 34, 221-B Building	TK-34-2	MISC	<u>Characteristics</u>: Shape: oval, height 4.27 meters, length 2.90 meters, width 1.52 meters. Material of construction: stainless steel. Capacity: 58,749 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 34	MISC	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 34 and the other cells. • Secondary containment for TK-34-2.
Cell 35, 221-B Building	TK-35-2	MISC	<u>Characteristics</u>: Shape: cylindrical, height 2.74 meters, diameter 2.74 meters. Material of construction: stainless steel. Capacity: 58,749 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 35	MISC	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 35 and the other cells. • Transfer piping between Cell 35 and the 224-B Building. • Secondary containment for TK-35-2.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment.
(sheet 17 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 36, 221-B Building	TK-36-1	MISC	<u>Characteristics</u>: Shape: oval, height 4.27 meters, length 2.90 meters, width 1.52 meters. Material of construction: stainless steel. Capacity: 58,749 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	Cell 36	MISC	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 36 and the other cells. • Secondary containment for TK-36-1.
Cell 39, 221-B Building	TK-39-1	LLW	<u>Characteristics</u>: Shape: oval, height 3.66 meters, length 2.90 meters, width 1.52 meters. Material of construction: stainless steel. Capacity: 13,120 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	TK-39-2	NCAW	<u>Characteristics</u>: Shape: cylindrical, height 3.86 meters, diameter 1.52 meters. Material of construction: stainless steel. Capacity: 6,814 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.
	TK-39-5	NCAW	<u>Characteristics</u>: Shape: oval, height 3.66 meters, length 2.90 meters, width 1.52 meters. Material of construction: stainless steel. Capacity: 7,571 liters. <u>Specific ancillary equipment</u>: Various jumpers that lead from vessel to the connections on the cell walls.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment.
(sheet 18 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
Cell 39, 221-B Building (cont)	Cell 39	LLW and NCAW	<u>General ancillary equipment</u>: • Hot pipe trench piping between Cell 39 and the other cells. • Transfer piping between Cell 39 and the 225-B Building. • Secondary containment for TK-39-1, TK-39-2, and TK-39-5.
221-BB Building	BCP	MISC	<u>Characteristics</u>: Shape: cylindrical, height 1.98 meters, diameter 1.07 meters. Material of construction: stainless steel. Capacity: 8,597 litters. <u>Specific ancillary equipment</u>: • Various jumpers that lead from the vessel to the pipe connections within the 221-BB Building condensate pit. • Transfer piping between BCP and - Cell 22 - Cell 23 - Cell 24 - 221-BF-A and 221-BF-B - 216-B-62 Crib and 216-B-64 Retention Basin via the BCS diverting pit.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment.
(sheet 19 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
221-BB Building (cont)	BCS	MISC	Characteristics: Shape: cylindrical, height 1.98 meters, diameter 1.07 meters. Material of construction: stainless steel. Capacity: 8,597 liters. Specific ancillary equipment: • Various jumpers that lead from the vessel to the pipe connections within the 221-BB Building condensate pit. • Transfer piping between BCS and - Cell 23 - Cell 24 - 221-B Building BCS header - 216-B-55 Crib and 216-B-64 Retention Basin via the BCS diverting pit.
	Condensate Pit	MISC	General ancillary equipment: • Transfer piping between 221-BB and - Cell 5 - Cell 23 - Cell 24. • Secondary containment for BCP and BCS.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment. (sheet 20 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
221-BF Facility	221-BF-A	MISC	<u>Characteristics</u>: Shape: oval, height 4.27 meters, length 4.88 meters, width 3.05 meters. Material of construction: stainless steel. Capacity: 186,280 liters. <u>Specific ancillary equipment</u>: • Various jumpers that lead from the vessel to the pipe connections within the 221-BF Building effluent control pit. • Overflow piping between 221-BF-A and 221-BF-B. • Transfer piping between 221-BF-A/221-BF-B and - BCP - 216-B-62 Crib - 216-B-64 Retention Basin via the BCS diverting pit.
	221-BF-B	MISC	<u>Characteristics</u>: Shape: oval, height 4.27 meters, length 4.88 meters, width 3.05 meters. Material of construction: stainless steel. Capacity: 186,280 liters. <u>Specific ancillary equipment</u>: • Various jumpers that lead from the vessel to the pipe connections within the 221-BF Building effluent control pit. • Overflow piping between 221-BF-A and 221-BF-B. • Transfer piping between 221-BF-A/221-BF-B and - BCP - 216-B-62 Crib - 216-B-64 Retention Basin via the BCS diverting pit.

Table 2-3. Treatment and/or Storage Vessel Characteristics and Related Ancillary Equipment. (sheet 21 of 21)

Location of vessels	Equipment or location	System	Vessel characteristics and related ancillary equipment
221-BF Facility (cont)	Tank Room	MISC	General ancillary equipment: Secondary containment for 221-BF-A and 221-BF-B.
276-BA Facility	ISO West	ORG	Characteristics: Shape: cylindrical, length 6.10 meters long, diameter 3.00 meters. Material of construction: stainless steel. Capacity: 17,500 liters. Specific ancillary equipment: None.
	ISO East	ORG	Characteristics: Shape: cylindrical, length 6.10 meters long, diameter 3.00 meters. Material of construction: stainless steel. Capacity: 17,500 liters. Specific ancillary equipment: None.
	276-BA	ORG	General ancillary equipment: • Secondary containment for ISO West. • Secondary containment for ISO East.

MISC = Miscellaneous Tank Storage
NCAW = Neutralized Current Acid Waste Storage and Treatment System
LLW = Low-Level Waste Storage and Treatment System
LLW Conc = LLW Concentrator
ORG = Organic Mixed Waste Storage System
TK-xx-xx = tank
T-xx-xx = tower
E-xx-xx = heat transfer equipment
D-xx-xx = de-entrainer
221-BB Building = Process Steam and Condensate Building.

CONTENTS

FIGURE

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3.0 PROCESS INFORMATION

This chapter discusses the missions of the B Plant Complex, the primary processes that occurred in the treatment and/or storage vessels systems, a summary of the historical processes associated with the vessel systems, and the storage processes associated with Cell 4 and the containment building.

3.1 B PLANT COMPLEX MISSIONS

The first mission was radiochemical separations to recover plutonium using the bismuth-phosphate process (1945 to 1952). The second mission was waste partitioning to separate and recover strontium and cesium using a solvent extraction and ion exchange process (1963 to 1983). Associated with the second mission was support for the WESF operations (1974 to 1998). The third mission was pretreatment of tank waste using ion exchange (1984 to 1990). The fourth and final mission is decommissioning (1995 onward). These activities are summarized in Figure 3-1.

3.1.1 Radiochemical Separations

The original mission was the recovery of plutonium from irradiated nuclear fuel using the bismuth-phosphate process. B Plant was the second full-scale radiochemical processing plant in the world. B Plant operated from 1945 to 1952. With newer and more efficient plutonium recovery facilities becoming operational, B Plant was shutdown in 1952. B Plant was then inactive until re-roled for the Waste Partitioning Mission (Section 3.1.2) in the early 1960's. The radiochemical separations mission did not contribute to the waste or waste residues in the B Plant treatment and/or storage systems. An extensive clean out of material from the radiochemical separations mission was conducted to prepare B Plant for the waste partitioning mission.

3.1.2 Waste Partitioning Mission

Modifications to the B Plant Complex began in 1963 and were completed in 1968. Waste partitioning operations started in 1968 and were completed in 1983. High-activity waste was partitioned using a combination solvent extraction and ion exchange process. A series of different process configurations were used during waste partitioning. The sources of the high-activity waste were the stored tank waste generated by processing operations at both the Reduction Oxidation (REDOX) and the Plutonium-Uranium Extraction (PUREX) Plants. After partitioning, the waste was returned to tank farms for continued storage.

The primary isotopes recovered during waste partitioning were strontium-90 via solvent extraction and cesium-137 via ion exchange. Other components partitioned out included promethium-147, technetium-99, rhodium, palladium, and a few other metals. Over 100 million curies of strontium-90 and cesium-137 were recovered in the form of 640 strontium fluoride capsules and 1577 cesium chloride capsules.

3.1.3 Support of Waste Encapsulation and Storage Facility Operations

An aspect of the waste partitioning mission was to support operations at WESF. WESF was constructed between 1970 and 1972 for storage of the strontium and cesium capsules produced during the waste partitioning mission. WESF became operational in 1974 and was considered an integral part of the B Plant Complex. WESF was separated from the B Plant Complex for independent operation during the Transition Phase.

3.1.4 Tank Waste Remediation Pretreatment Project

The purpose of the pretreatment project was to separate the tank waste into high- and low-activity (i.e., radioactivity) waste streams. The high-activity waste would be sent to the Hanford Waste Vitrification Plant (HWVP) and the low-activity waste would be sent to the Grout Treatment Facility. Pretreatment used an ion exchange process to do the separation.

The B Plant Complex was selected to house the pretreatment process in the mid-1980's. Between 1987 and 1990, the necessary permits were sought to operate the B Plant Complex as the pretreatment facility. In 1990, it was determined that the B Plant Complex could not meet modern safety, seismic, and containment criteria. Because of these regulatory concerns, full-scale pretreatment did not occur.

3.1.5 Facility Decommissioning

The final mission, which commenced October 5, 1995, is facility decommissioning. The scope of facility decommissioning is defined in Chapter 8 of the Tri-Party Agreement. Facility decommissioning is divided into three phases: transition, surveillance and maintenance (S&M), and disposition.

The Transition Phase involves stabilization, deactivation, and limited decontamination to bring the facility into a safe condition for entry into the long-term S&M phase. The goal of the Transition Phase preclosure activities is to place the waste management units into a safe and environmentally secure condition that requires minimum maintenance and care.

The objectives of the S&M Phase are to ensure adequate containment of any contaminants left in place, to provide physical safety and security controls, and to maintain the B Plant Complex in a manner that will present no significant risk to human health or the environment. A S&M Plan will be developed that will address (1) surveillance, (2) maintenance, (3) quality assurance, (4) radiological controls, (5) hazardous materials protection, (6) health and safety plus emergency preparedness, (7) safeguards and security, and (8) cost and schedule.

The Disposition Phase involves taking the B Plant Complex to a final end-state. Disposition Phase activities could include decontamination, dismantling, entombment, closure, and site restoration. For the B Plant Complex, this would include final closure or closure with postclosure care of the three waste management units (treatment and/or storage in vessels, containerized waste storage, and storage in a containment building).

3.2 TREATMENT AND/OR STORAGE VESSEL PROCESS DESCRIPTIONS

Before being regulated, the processing operations conducted in the vessel systems included storage, separations using precipitation and centrifugation, solvent extraction, and ion exchange, concentration by evaporation, de-entrainment (removing droplets of liquid traveling in a vapor stream), condensation of a vapor stream, and chemical additions. General process summaries for the individual vessel systems are presented in Section 3.3. Because these processes were not active when the B Plant Complex was regulated as a TSD unit, these processes are not addressed in detail.

Only two processes occurred in the vessel system following regulation in 1987: waste storage (Section 3.2.1) and waste treatment by chemical addition (Section 3.2.2). The decontamination of the organic mixed waste was part of the Transition Phase activities and is discussed in greater detail in Chapter 7.0, Section 7.1.3.

3.2.1 Waste Storage

Waste storage is simply storage of mixed waste in a vessel for more than 90 days. All treatment and/or storage vessel systems in the B Plant Complex were involved in waste storage.

3.2.2 Treatment by Chemical Addition

Treatment by chemical addition is done for waste being transferred to the DST System. The purpose of this treatment is to change some of the characteristics of the waste to meet the DST System waste acceptance criteria (DOE/RL-90-39). Part of the DST System waste acceptance criteria is a pH greater than 12.0 and a nitrite concentration greater than 0.011 molarity (*M*). The purpose of the acceptance criteria is to obtain the necessary conditions to inhibit corrosion of the carbon steel tanks in the DST System. Generally, sodium hydroxide is added to raise the pH and sodium nitrite is added to raise the nitrite concentration. Only the treatment and/or storage vessels that routinely treated waste by chemical addition were part of the LLW Storage and Treatment System.

3.3 TREATMENT AND/OR STORAGE VESSEL SYSTEM PROCESS SUMMARIES

The process history for each of the treatment and/or storage vessel systems is summarized in the following sections.

3.3.1 Neutralized Current Acid Waste Treatment and Storage System Process Summary

The NCAW Treatment and Storage System was part of the Tank Waste Remediation Pretreatment Project. Following regulation as a treatment and/or storage vessel system, the primary process has been waste storage. The system includes a series of tanks, a sintered metal filter, and an ion exchange column. The vessels involved are identified in Chapter 2.0, Tables 2-2 and 2-3 and in Figure 2-9.

No waste processing operations using the NCAW Storage and Treatment System took place. Some limited, demonstration scale-testing using demineralized waste occurred during 1986 and 1987. In 1990, the use of the B Plant Complex for pretreatment of tank waste was abandoned. All remaining NCAW solutions were transferred back to the DST System in May of 1993. The NCAW system has been inactive since then.

The NCAW Storage and Treatment System is spread out between six process cells in the 221-B Building and includes 10 vessel systems (Chapter 2.0, Figure 2-9). The specifics of each vessel, its location, physical characteristics, and ancillary equipment are presented in Chapter 2.0, Tables 2-2 and 2-3.

3.3.2 Low-Level Waste Storage and Treatment System Process Summary

The LLW Storage and Treatment System supports the general operations of the B Plant Complex. This is the only vessel system operated after the B Plant Complex became regulated as a TSD unit. The system consists of a series of storage and treatment tanks. The system was used to collect and store process drainage from the B Plant Complex that would not be transferred to the DST System within 90 days. An example of process drainage includes steam condensate contaminated with low-activity radionuclides. Similar liquids were collected from WESF. Before transfer to the DST System, the LLW was treated to meet the DST System waste acceptance criteria.

The LLW Storage and Treatment System is spread among six process cells in the 221-B Building and includes eight vessel systems (Chapter 2.0, Figure 2-9). The specifics of each vessel, its location, physical characteristics, and ancillary equipment are presented in Chapter 2.0, Tables 2-2 and 2-3.

This system operated well into the Transition Phase of facility decommission because the system supported WESF and the Transition Phase activities. The LLW Storage and Treatment System will be deactivated in 1998.

3.3.3 Low-Level Waste Concentrator Process Summary

The LLW Concentrator was operated to concentrate the LLW in the LLW Storage and Treatment System. The LLW Concentrator last operated in 1987.

Operations were completed before the B Plant Complex was regulated as a TSD unit. Following regulation, the primary process has been waste storage.

The LLW Concentrator is located in one process cell and consists of the three-component waste concentrator, a de-entrainer (which removes droplets of liquid from the vapor coming off the concentrator), a condenser, and two tanks. The three components of the waste concentrator are the concentrator and two tube bundles (a thermal-siphon reboiler and shell-and-tube heat exchanger). The vessels involved are identified in Chapter 2.0, Tables 2-2 and 2-3 and in Figure 2-9.

3.3.4 Organic Mixed Waste Storage System Process Summary

The Organic Mixed Waste Storage System was used to store the radiologically contaminated organic solvent left from the waste partitioning mission. Following regulation, the primary process has been waste storage. From 1995 through 1997, the organic mixed waste was treated to reduce the concentration of radionuclides (Chapter 7.0, Section 7.1.3). This treatment activity was conducted per the Tri-Party Agreement Milestone M-32-07.

The Organic Mixed Waste Storage System consists of 10 storage tanks (Chapter 2.0, Tables 2-2 and 2-3), eight in the 221-B Building process cells (Chapter 2.0, Figure 2-9) and two external tanks (Chapter 2.0, Figure 2-8) in the 276-BA Interim Organic Storage Facility.

3.3.5 Miscellaneous Tank Storage System Process Summary

The Miscellaneous Tank Storage System has tanks considered to have handled or contained dangerous waste after 1987. These tanks were added to the B Plant Complex Part A, Form 3, Permit Application in 1996. Following regulation, the primary process has been waste storage. The waste sources can include past operations (waste partitioning, pretreatment, WESF support) and heels left after tank flushing. These tanks are not necessarily connected. These 20 tanks are identified in Chapter 2.0, Tables 2-2 and 2-3 and in Figures 2-5, 2-6, and 2-9.

3.4 CELL 4 CONTAINER STORAGE

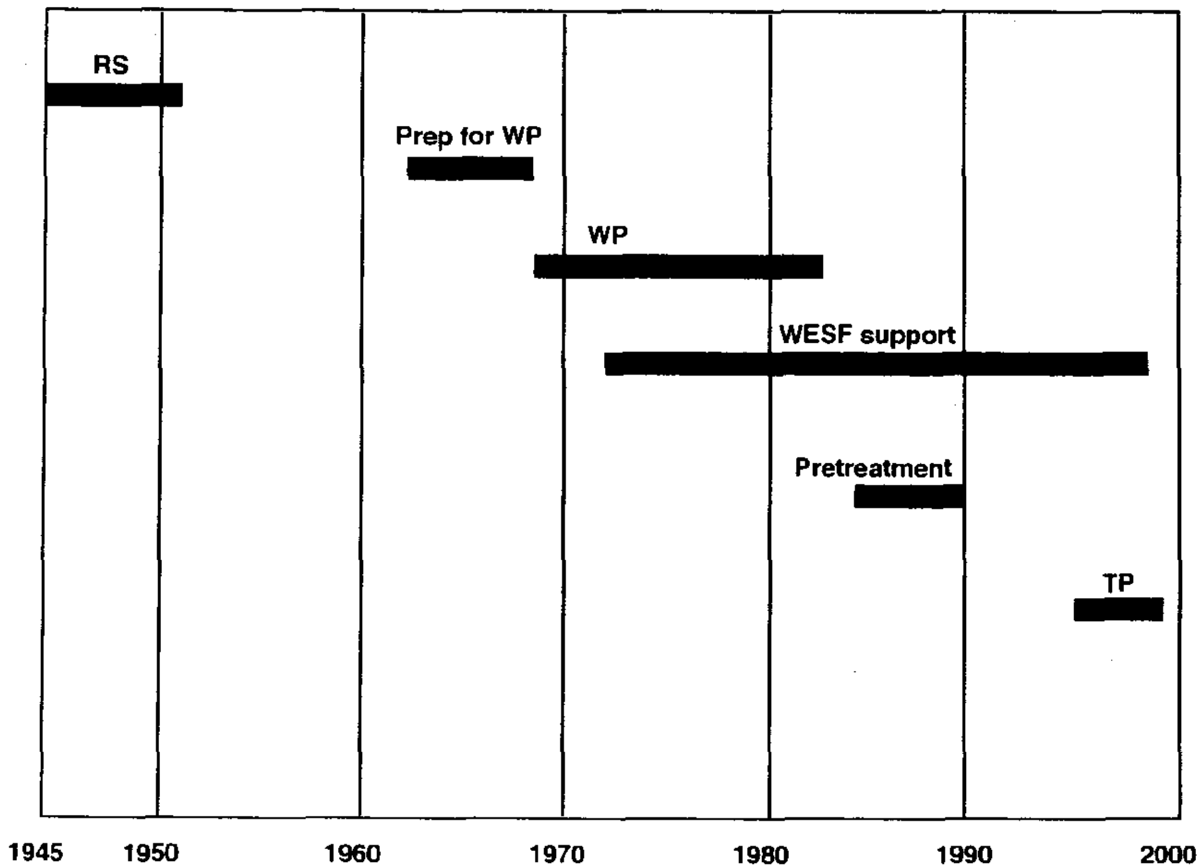
The only process associated with the Cell 4 Container Storage is storage of solid waste. From 1987, containers (e.g., 208-liter containers) of mixed waste has been stored in Cell 4 of the 221-B Building. In addition to the mixed waste, radioactive waste also is stored in Cell 4. This waste was generated from general maintenance-type operations in WESF. The level of radiation associated with these containers is high enough to prevent the containers from being contact handled. The dangerous waste is lead that is part of various types of spent light bulbs.

3.5 CONTAINMENT BUILDING

The only process associated with the containment building is the storage of solid waste. Since 1987, discarded radioactively-contaminated process equipment has been stored at various locations on the canyon deck and in some of the process cells. This discarded equipment is considered a mixed waste because the equipment contains lead in the form of weights, counter weights, or radiation shielding and/or has been contaminated with dangerous waste constituents associated with the pretreatment mission or with storing tank waste. Additional information on the dangerous waste concerns is presented in Chapter 4.0.

The mixed waste stored on the canyon deck could rest directly on the deck. The mixed waste stored in the process cells could rest directly on the floor of the cell. Separate storage containers are not used. Handling the mixed waste is performed remotely because of the high radiation levels associated with the radioactively-contaminated discarded process equipment. Remote handling is performed with two, overhead, bridge-type maintenance cranes (41-tonne hoist maximum crane capacity). The cranes are used to remove equipment from installed position and transport the equipment to the storage location.

B Plant Mission Summary Through the Transition Phase



RS	=	Radiochemical Separations, 1945 to 1952
Prep for WP	=	Preparation for the Waste Partitioning Mission, 1963 to 1968
WP	=	Waste Partitioning Mission, 1968 to 1983
WESF Support	=	Support of WESF Operations, 1974 to 1998
Pretreatment	=	Tank Waste Remediation Pretreatment Project, 1984 to 1990
TP	=	Transition Phase of Facility Decommissioning

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Figure 3-1. B Plant Complex Mission Summary through the Transition Phase.

CONTENTS

TABLES

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4.0 WASTE CHARACTERISTICS

This chapter describes the characteristics of the waste within the B Plant Complex at the end of the Transition Phase activities. There are three general waste types: liquid mixed waste handled by the treatment and/or storage vessel systems, containerized mixed waste from WESF operations, and discarded process equipment.

4.1 CHARACTERISTICS OF THE LIQUID MIXED WASTE

The liquid mixed waste handled in the treatment and/or storage vessel systems primarily came from the Waste Partitioning Mission (Chapter 3.0, Section 3.1.2) and from the Tank Waste Remediation Pretreatment Project (Chapter 3.0, Section 3.1.4). Both missions processed the high activity waste stored in Hanford Site waste tanks.

The liquid mixed waste consists of a liquid and entrained solids with two types of dangerous waste constituents of concern: metals and listed organics. In addition, the liquid mixed waste could have a single characteristic hazard: corrosivity. Any liquid mixed waste remaining in the B Plant waste management units could be in the form of residue or tank heels.

4.1.1 Constituents of Concern: Metals

The following are the eight metal constituents of concern in the liquid mixed waste: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. The primary source of these metals is the residue from the processing of nuclear fuel for the recovery of plutonium. These constituents of concern and their corresponding dangerous waste numbers are presented in Table 4-1.

4.1.2 Constituents of Concern: Listed Organics

Before transfer to B Plant Complex, the liquid mixed waste contained various spent organic solvents. The constituents in these solvents resulted in the waste being determined to be listed waste with dangerous waste numbers F001, F002, F003, F004, and F005. Listed, spent solvents (F001, F002, and F004) also were generated at B Plant during radiological decontamination of the canyon crane. The following are the seven listed organics associated with these dangerous waste numbers: acetone, o-cresol, p-cresol, methylene chloride, methyl ethyl ketone, methyl isobutyl ketone, and 1,1,1-trichloroethane.

These constituents of concern and their corresponding dangerous waste numbers are presented in Table 4-1. Within the B Plant Complex, none of these organic constituents of concern are expected to be found in concentrations above the analytical detection limits.

Three of the organic constituents of concern have synonyms that can cause confusion. A common synonym for methylene chloride is dichloromethane. A common synonym for methyl ethyl ketone is 2-butanone. Two common synonyms for methyl isobutyl ketone are hexone and 4-methyl-2-pentanone.

The organic constituents of concern can be classified into three categories based on chemical composition. Acetone, methyl ethyl ketone, and methyl isobutyl ketone are non-halogenated volatile organics. Methylene chloride and 1,1,1-trichloroethane are halogenated volatile organics. The p-cresol and o-cresol are phenols.

4.1.3 Characteristic Hazard: Corrosivity

The liquid mixed waste also could be dangerous waste due to the characteristic of corrosivity. This characteristic resulted from adding sodium hydroxide to the waste to meet DST System acceptance requirements before the original transfer of waste from the reprocessing plants. Also, the characteristic of corrosivity can apply to the treatment by chemical addition (Chapter 3.0, Section 3.2.2) done in the B Plant Complex before transferring waste to the DST System.

4.1.4 Forms and Hazards of Liquid Mixed Waste: Waste Residues

At the end of the Transition Phase activities, waste in the treatment and/or storage tanks could be in two forms. One is waste residue in and on process equipment and structures (e.g., cell floors and tank walls). The second form is tank heels and is discussed in Section 4.1.5.

The waste residues can include coatings or deposits on various parts of the vessel systems or structures, sludge or solids in the bottoms of tanks or structures (e.g., sumps), and dried tank heels. The sources of the sludge and solids would be the solids carried in with the liquid mixed waste and the solids that precipitated out of the liquid solutions during past operations. Dried tank heels could also be sources of both the sludge and coatings or deposits. The mass and volume of coating and deposits are expected to be small relative to the mass and size of the equipment. The sludges and solids have a potential to be larger, but generally would be only a fraction of the volume of the tank heel.

The waste residues could contain the metal constituents of concern. It is also possible that the waste residue could exhibit the characteristic of corrosivity as a corrosive solid. Whether this characteristic is demonstrated would depend on the composition of the liquid mixed waste before becoming a residue.

The original concentrations of the listed organic constituents of concern in the liquid mixed waste are believed to be below the analytical detection limits. Therefore, the listed organic constituents of concern in the waste residues are not expected to be found. Because of the regulatory requirements of the derived from and mixture rules [WAC 173-303-070(2)(a)(ii)(B)], the waste residue must carry the F001 through F005 dangerous waste numbers.

The condition of the specific treatment and/or storage vessel systems relative to waste residues is discussed in Sections 4.2 and 4.4.

4.1.5 Forms and Hazards of the Liquid Mixed Waste: Tank Heels

At the end of the Transition Phase activities, liquid mixed waste in the treatment and/or storage tanks could be in two forms. One of these forms is tank heels. The other form is waste residue, discussed in Section 4.1.4. The tank heels contain liquid and also could contain solids or sludges. The concentrations of the constituents of concern in the liquid phase could differ from the concentrations in the solids or sludges. The tank heels could contain the metal constituents of concern. The tank heels also could demonstrate the characteristic of corrosivity. Whether this characteristic is demonstrated depends on the composition of the tank heel at the end of the Transition Phase.

The original concentrations of the listed organic constituents of concern in the liquid mixed waste are believed to be below the analytical detection limits. Therefore, the listed organic constituents of concern in the tank heels are not expected to be found. Because of the regulatory requirements of the derived from and mixture rules, the tank heels must carry the F001 through F005 dangerous waste numbers.

The condition of the specific treatment and/or storage vessel systems relative to waste residues is discussed in Section 4.2.

There is potential for the liquid portion of the tank heels to evaporate during the S&M Phase. It is not known how much or how fast the liquid would evaporate. It is possible for the tank heels to dry into a waste residue during the S&M Phase, leaving a waste residue having the form and hazards discussed in Section 4.1.4.

4.2 WASTE CHARACTERISTICS IN THE TREATMENT AND/OR STORAGE VESSEL SYSTEMS

The waste remaining in the treatment and/or storage vessels systems at the end of the Transition Phase activities could be waste residues from past operations and tank heels.

The presence of waste residues and tank heels has been determined by several different methods. The presence of solids and sludges (i.e., waste residue) in the vessels tanks has been determined by direct measurement using a dip rod. Some waste residues have been observed visually in various parts of the secondary containment. The presence of tank heels has been determined by measurements, both from the tank instrumentation and directly using a dip rod. Small amounts of waste residue in the form of coatings and deposits are suspected to exist but have not been confirmed visually.

4.2.1 Listed Waste within the Treatment and/or Storage Vessel Systems

All of the liquid mixed waste processed in the B Plant Complex has been determined to be listed waste subject to the land disposal restrictions (40 CFR 268). The applicable listed dangerous waste numbers are identified in Section 4.1.2. Because of the effects of the derived from and mixture rules, all of the treatment and/or storage vessel systems that have handled liquid mixed waste are listed waste upon disposal.

4.2.2 Neutralized Current Acid Waste Storage And Treatment System

The 10 vessels in the NCAW Storage and Treatment System could contain waste residue. The 10 vessels are identified in Chapter 2.0, Tables 2-2 and 2-3 and in Figure 2-9. All 10 vessels (TK-6-2, TK-7-1, TK-7-2, TK-8-1, TK-8-2, TK-13-1, TK-14-2, TK-29-3, TK-39-2, and TK-39-5) are empty and do not contain a tank heel. Additional information is given in Table 4-2.

4.2.3 Low-Level Waste Storage And Treatment System

The eight vessels in the LLW Storage and Treatment System may contain waste residue. The eight vessels are identified in Chapter 2.0, Tables 2-2 and 2-3 and in Figure 2-9. All eight treatment and/or storage system vessels (TK-9-1, TK-9-2, TK-10-1, TK-24-1, TK-25-1, TK-25-2, TK-26-3, and TK-39-1) are known to contain a tank heel. Additional information is given in Table 4-2.

4.2.4 Low-Level Waste Concentrator System

The six vessels in the LLW Concentrator System may contain waste residue. The six vessels are identified in Chapter 2.0, Tables 2-2 and 2-3 and in Figure 2-9. Four vessels (TK-23-1, E-23-3, E-23-3-1, and E-23-3-2) are empty and do not contain a tank heel but are known to contain waste residue in the form of solids or a sludge in the bottom of the tanks. The two remaining vessels (E-23-4 and D-23-2) are empty and do not contain a tank heel. Additional information is given in Table 4-2.

4.2.5 Organic Mixed Waste Storage System

The 10 vessels in the Organic Mixed Waste Storage System may contain waste residue. The 10 vessels are identified in Chapter 2.0, Tables 2-2 and 2-3 and in Figures 2-8 and 2-9. Seven vessels (TK-26-1, TK-27-2, TK-27-3, TK-27-4, TK-28-3, TK-29-4, and TK-30-3) are known to contain a tank heel. One vessel (TK-28-4) is empty and does not contain a tank heel. Two vessels (ISO East and ISO West) will be closed and removed from the B Plant Complex. Additional information is given in Table 4-2.

4.2.6 Miscellaneous Tank Storage

The 20 vessels in the Miscellaneous Tank Storage may contain waste residue. The 20 vessels are identified in Chapter 2.0, Tables 2-2 and 2-3 and in Figure 2-9. Sixteen vessels (E-5-2, T-18-2, TK-18-3, E-20-2, TK-21-1, TK-22-1, T-28-1, TK-29-2, T-30-1, TK-32-1, TK-34-2, TK-35-2, BCP, BCS, 221-BF-A, and 221-BF-B) are known to contain a tank heel. One vessel (TK-33-1) is empty and does not contain a heel but is known to contain dry solids. The three remaining vessels (TK-17-1, TK-17-2, and TK-36-1) are empty and do not contain a tank heel. Additional information is given in Table 4-2.

4.3 CELL 4 CONTAINER STORAGE

The only dangerous waste constituent in the Cell 4 mixed waste containers is lead. The source of the lead is radiologically contaminated, spent light bulbs from WESF. The total mass of lead waste is 0.0781 kilogram. No liquids are present. A total of seven mixed waste containers are stored. All are 208-liter containers. Table 4-3 lists the estimated inventory of waste for each mixed waste container. Additional containers of radioactive-only waste also are stored in Cell 4.

Interim storage in Cell 4 was chosen as the best stabilization method for this material because interim storage was environmentally sound, considered personnel safety, and was cost effective. The radiological hazard from these containers is much greater than the dangerous waste hazard as the radiological dose rates from these containers is in the rads per hour range. This is sufficiently high to preclude contact handling of these containers. The waste in Cell 4 will remain in place through the S&M phase.

4.4 CONTAINMENT BUILDING

Discarded process equipment is managed in the containment building. Two waste types associated with this equipment are waste residues (including listed constituents) and elemental lead used as weights, counterweights, and/or radiation shielding. However, the radiological hazard for this equipment is greater than the dangerous waste hazard. The discarded process equipment is stored on the canyon deck and in the process cells.

Interim storage in the containment building was chosen as the best stabilization method for the discarded equipment because interim storage was environmentally sound, considered personnel safety, and was cost effective. The discarded equipment will remain in the containment building through the S&M phase. Removal could occur in conjunction with the rest of the process equipment during the Disposition Phase of the Decommissioning Process.

All of the liquid mixed waste processed in the B Plant Complex has been determined to be listed waste subject to LDR. The applicable listed dangerous waste numbers are identified in Section 4.1.5. Because of the effects of the derived from and mixture rules, all of the discarded process equipment (that had contacted DST liquid mixed waste) stored in the containment building is listed waste.

Table 4-1. Tank Waste Constituents of Concern.

Dangerous waste constituent of concern	CAS number	Dangerous waste number
Arsenic	7440-38-2	D004
Barium	7440-39-3	D005
Cadmium	7440-43-9	D006
Chromium	7440-47-3	D007
Lead	7439-92-1	D008
Mercury	7439-97-6	D009
Selenium	7782-49-2	D010
Silver	7440-22-4	D011
Methylene chloride	75-09-2	F001, F002
1,1,1-trichlorethane	71-55-6	F001, F002
Acetone	67-64-1	F003
Methyl isobutyl ketone	108-10-1	F003
o-cresol	95-48-7	F004
p-cresol	106-44-5	F004
Methyl ethyl ketone	71-36-3	F005

CAS = Chemical Abstracts Service.

Table 4-2. Treatment and/or Storage Vessels Status.
(sheet 1 of 5)

Vessel	System	Tank Heel (volume in liters)	Waste Residue Known to be Present	Comments
E-5-2	MISC	197	No	Empty and below minimum heel.
TK-6-2	NCAW	None	No	Empty and dry.
TK-7-1	NCAW	None	No	Empty and dry.
TK-7-2	NCAW	None	No	Empty and dry.
TK-8-1	NCAW	None	No	Empty and dry.
TK-8-2	NCAW	None	No	Empty and dry.
TK-9-1	LLW	182	No	Empty and below minimum heel.
TK-9-2	LLW	745	Yes	Empty and below minimum heel. Volume of residue is about 745 liters.
TK-10-1	LLW	5776	Yes	Empty and below minimum heel. Large amount of waste residue (solids/sludge) present is increasing the heel volume. Volume of residue is not known.
TK-13-1	NCAW	None	No	Empty and dry.
Tk-14-2	NCAW	None	No	Empty and dry.
TK-17-1	MISC	None	No	Empty and dry.
TK-17-2	MISC	None	No	Empty and dry.
T-18-2	MISC	681	No	Empty and below minimum heel. This column contains an unknown amount of ion exchange resin.
TK-18-3	MISC	Less than 61	No	Empty and below minimum heel.
E-20-2	MISC	None	No	Empty and dry.

Table 4-2. Treatment and/or Storage Vessels Status.
(sheet 2 of 5)

Vessel	System	Tank Heel (volume in liters)	Waste Residue Known to be Present	Comments
TK-21-1	MISC	1518	No	Empty and below minimum heel.
TK-22-1	MISC	Less than 189	No	Empty and below minimum heel.
TK-23-1	LLW CONC	None	Yes	Empty and dry with waste residue (solids/sludge) present. Volume of residue is about 167 liters.
E-23-3	LLW CONC	None	Yes	Empty and dry with waste residue (solids/sludge) present. Volume of residue is not known. Residue is known to be about 1 meter thick on bottom of vessel.
E-23-3-1	LLW CONC	None	Yes	Empty and dry with waste residue (solids/sludge) present. Volume of Residue is not known. Residue is known to be about 1 meter thick on bottom of vessel.
E-23-3-2	LLW CONC	None	Yes	Empty and dry with waste residue (solids/sludge) present. Volume of residue is not known. Residue is known to be about 1 meter thick on bottom of vessel.
E-23-4	LLW CONC	None	No	Empty and dry.
D-23-2	LLW CONC	None	No	Empty and dry.
TK-24-1	LLW	2177	Yes	Empty and below minimum heel. Large amount of waste residue (solids/ sludge) present is increasing heel volume. Volume of residue is not known.

Table 4-2. Treatment and/or Storage Vessels Status.
(sheet 3 of 5)

Vessel	System	Tank Heel (volume in liters)	Waste Residue Known to be Present	Comments
TK-25-1	LLW	None	No	Empty and dry.
TK-25-2	LLW	7972	Yes	Empty and below minimum heel. Large amount of waste residue (solids/ sludge) present is increasing heel volume. Volume of residue is not known.
TK-26-1	ORG	833	Yes	Empty and below minimum heel. Large amount of waste residue (solids/ sludge) present is increasing heel volume. Volume of residue is not known.
TK-26-3	LLW	246	Yes	Empty and below minimum heel. Large amount of waste residue (solids/ sludge) present is increasing heel volume. Volume of residue is not known.
TK-27-2	ORG	303	Yes	Empty and below minimum heel. Large amount of waste residue (solids/ sludge) present is increasing heel volume. Volume of residue is not known.
TK-27-3	ORG	6814	Yes	Empty and below minimum heel. Large amount of waste residue (solids/ sludge) is present increasing heel volume. Volume of residue is not known.
TK-27-4	ORG	42	No	Empty and below minimum heel.
T-28-1	MISC	151	No	Empty and below minimum heel.

Table 4-2. Treatment and/or Storage Vessels Status.
(sheet 4 of 5)

Vessel	System	Tank Heel (volume in liters)	Waste Residue Known to be Present	Comments
TK-28-3	ORG	6814	Yes	Empty and below minimum heel. Large amount of waste residue (solids/ sludge) present is increasing heel volume. Volume of residue is not known.
TK-28-4	ORG	None	No	Empty and dry.
TK-29-2	MISC	Less than 189	No	Empty and below minimum heel.
TK-29-3	NCAW	None	No	Empty and dry.
TK-29-4	ORG	4	No	Empty and below minimum heel.
T-30-1	MISC	151	No	Empty and below minimum heel.
TK-30-3	ORG	435	Yes	Empty and below minimum heel. Large amount of waste residue (solids/ sludge) present is increasing heel volume. Volume of residue is not known.
TK-32-1	MISC	379	No	Empty and below minimum heel.
TK-33-1	MISC	None	Yes	Empty and dry with waste residue (solids/sludge) present. The solids layer is about 150 millimeters thick. The volume of solids is estimated at about 1950 liters.
TK-34-2	MISC	Less than 189	No	Empty and below minimum heel.
TK-35-2	MISC	Less than 189	No	Empty and below minimum heel.
TK-36-1	MISC	None	No	Empty and dry.

Table 4-2. Treatment and/or Storage Vessels Status.
(sheet 5 of 5)

Vessel	System	Tank Heel (volume in liters)	Waste Residue Known to be Present	Comments
TK-39-1	LLW	492	Yes	Empty and below minimum heel with waste residue (solids/sludge) present. Volume of residue is not known.
TK-39-2	NCAW	None	No	Empty and dry.
TK-39-5	NCAW	None	No	Empty and dry
BCP	MISC	Less than 189	No	Empty and below minimum heel.
BCS	MISC	Less than 189	No	Empty and below minimum heel.
221-BF-A	MISC	235	No	Empty and below minimum heel.
221-BF-B	MISC	235	No	Empty and below minimum heel.
ISO East	ORG	None	No	Empty and never stored waste. Tank planned for removal during closure of 276-BA Facility.
ISO West	ORG	None	No	Empty and below minimum heel. Tank planned for removal during closure of 276-BA Facility.

MISC = miscellaneous tank storage
LLW = Low-Level Waste Storage and Treatment System
LLW Conc = LLW Concentrator
ORG = Organic Mixed Waste Storage System
NCAW = Neutralized Current Acid Waste Storage and Treatment System
TK-xx-xx = tank
T-xx-xx = tower
E-xx-xx = heat transfer equipment
D-xx-xx = deentrainer

Table 4-3. Cell 4 Waste Inventory (lead solder on light bulb).

Container number	Total weight (kilograms)	Container weight (kilograms)	Total waste weight (kilograms)	Approximate weight of regulated constituent (kilograms)
KT-984	80.3	34.9	45.4	0.0113
KT-993	75.3	34.9	40.4	0.0113
KT-A12	106.1	34.9	71.2	0.0113
KT-A15	75.7	34.9	40.8	0.0113
KT-983*	90.7	34.9	55.8	0.0113
KT-A24	51.9	34.9	17.0	0.0113
KT-A16	45.0	34.9	17.0	0.0113
TOTALS	525.0	244.3	280.7	0.0781

* No inventory sheet was found for this container. All values are estimates.

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5.0 GROUNDWATER

In accordance with the Tri-Party Agreement (Ecology et al. 1996), groundwater in the 200 East Area will be included in the 200-PO-1 operable unit and will be investigated under *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) *of 1980* remedial investigation/ feasibility study process. Therefore, groundwater investigation/remediation is not addressed as part of this preclosure work plan. Work on the 200-PO-1 operable unit will be coordinated with the final disposition process but will not occur until the final groundwater operable unit workplan has been approved.

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6.0 TRANSITION PHASE STRATEGY

This chapter describes the Transition Phase strategy and provides a general description of the S&M Phase and Disposition Phase activities.

Preclosure of the TSD unit will occur in conjunction with the overall decommissioning of the B Plant Complex. The Transition Phase activities place the B Plant Complex TSD unit in a deactivated state. Dangerous waste left in place will be identified during the Transition Phase and managed during the S&M Phase. The S&M phase will maintain the B Plant Complex in a safe and environmentally secure configuration for 10 or more years. The Disposition Phase will address final closure activities [for portions of the B Plant Complex identified in the Part A, Form 3, Permit Application (DOE/RL-88-21)] in accordance with WAC 173-303. If required, postclosure care requirements would be integrated with the post-remediation groundwater monitoring requirements established for the 200-PO-1 operable unit.

This phased approach to closure allows for an expedient full deactivation of the B Plant Complex in a manner that is safe and cost-effective, while minimizing the risk to human health and the environment.

The Transition Phase activities will place the B Plant Complex in a deactivated state. The Transition Phase consists of completion of end point criteria as defined in the *B Plant End Points Document* (WHC-SD-WM-TPP-054). End point criteria are used to achieve a safe, stable, and environmentally secure facility suitable for a low cost S&M program. End points were created to ensure a thorough measure of completeness in preparing the B Plant Complex for future decontamination and decommissioning. End point criteria currently are being used to confirm completion of Transition Phase activities and to substantiate the readiness for transition to the S&M phase.

6.1 SURVEILLANCE AND MAINTENANCE

During the S&M phase, the B Plant Complex will be unoccupied and locked. The only active systems or utilities associated with the B Plant Complex TSD units will be the canyon ventilation and surveillance lighting systems within the 221-B Building. The S&M plan addresses compliance with RCRA and WAC 173-303 requirements. The S&M plan outlines activities for monitoring of active systems and for maintaining the B Plant Complex in a safe condition that presents no significant threat of release of hazardous substances into the environment and no significant risk to human health and the environment until final disposition is completed. The completion of these activities are necessary before the final disposition of the B Plant Complex can be implemented.

6.2 DISPOSITION

Closure of the B Plant TSD unit will occur during the Disposition Phase (i.e., end state of the systems, dangerous waste and/or hazardous substances left in place, end state of the canyon structure, and integration with the CERCLA remedial activities).

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7.0 TRANSITION PHASE ACTIVITIES

This chapter describes the Transition Phase preclosure activities at the B Plant Complex. The objective of the Transition Phase is to place the B Plant Complex in a safe configuration with respect to human health and the environment. The deactivated facility will begin the S&M phase of 10 or more years until disposition activities commence. The Disposition Phase activities required to achieve final closure will be planned during the S&M phase. A closure plan for the final closure of the B Plant Complex TSD unit will be implemented in conjunction with the overall facility disposition.

7.1 DISPOSITION OF TREATMENT AND/OR STORAGE VESSEL DURING THE TRANSITION PHASE

The transition phase activities and disposition of the treatment and/or storage vessels during the transition phase is discussed in the following sections.

7.1.1 Isolation of the Treatment and/or Storage Vessels

The main Transition Phase activity associated with all of the treatment and/or storage vessel systems is isolation. Isolation involves removing the jumpers connecting each treatment and/or storage vessel to pipe connections located on the walls of the process cells or pit and installing blank connections to prevent any liquids from reaching the tanks. In addition to the pipe jumpers that handled waste, other jumpers (electrical, steam, water, chemical addition, and/or instruments) also could be removed, as necessary, to isolate the treatment and/or storage vessels.

7.1.2 Treatment and/or Storage Vessels Emptied Prior to October 5, 1995

Before the start of facility decommissioning on October 5, 1995, a total of 14 treatment and/or storage vessels in three systems had been emptied. These 14 vessels are as follows:

NCAW Treatment and Storage System vessels:

TK-6-2	TK-7-2	TK-8-2	TK-14-2	TK-39-2
TK-7-1	TK-8-1	TK-13-1	TK-29-3	TK-39-5.

Miscellaneous Storage Tanks:

TK-17-1 TK-17-2 TK-36-1.

LLW Storage and Treatment System vessel:

TK-25-1.

The emptied vessels comprise all 10 of the NCAW Treatment and Storage System vessels. In Miscellaneous Tank Storage, three of the 20 vessels have been emptied. The emptying of the NCAW and Miscellaneous Tank Storage vessels occurred in 1993 as part of the transfer of the tank waste back to the DST System. In the LLW Storage and Treatment System, one out of seven vessels have been emptied.

7.1.3 Disposition of the Organic Mixed Waste

Removal and disposal of the organic mixed waste in the Organic Mixed Waste Storage System have been one of the major goals during the Transition Phase. The radionuclide concentrations in the organic mixed waste need to be reduced before the waste could be moved outside of the B Plant canyon. In support of this requirement, Tri-Party Agreement Milestone M-32-07 "Complete B Plant interim Status Tank Actions" was established. M-32-07 included a target milestone M-32-07-T05 for treating the mixed organic waste to support disposition of the waste for offsite disposal or onsite compliant interim storage. The treatment method was to chemically wash the organic and filter the solids. This treatment activity was conducted from 1995 to 1997 and successfully reduced the radionuclide concentration in the organic mixed waste.

The completion of the treatment effort allowed for the transfer of the bulk of the organic waste from the 221-B Building canyon vessels to an external storage tank (ISO East) in the 276-BA Facility during 1997. In late 1997, this organic mixed waste was shipped to Diversified Scientific Services, Inc., in Tennessee, for disposal by incineration.

7.1.4 Disposition of the 276-BA Facility External Organic Treatment and/or Storage Vessels

It is planned to pursue clean closure of the 276-BA Facility during the Transition Phase. Closure of the 276-BA Facility would be conducted per requirements of the WAC 173-303-610. The intention is to:

- Remove ISO West and ISO East vessels for reuse
- Clean close the secondary containment structure
- Modify the B Plant Part A, Form 3, permit application to reflect the closure of the 276-BA Facility, ISO East, and ISO West.

This activity, in the advanced planning stage, will require negotiations with Ecology. The results of the negotiations and the resulting closure activities will be documented independently of this preclosure work plan.

7.2 CELL 4 ACTIVITIES DURING THE TRANSITION PHASE

Cell 4 will continue storing highly radioactive waste and mixed waste through the Transition and S&M Phases. The primary Transition Phase activities were the addition of two containers (KT-A16 and KT-A24) into Cell 4 and to document the dangerous waste inventory in Cell 4 (Chapter 4.0, Section 4.3). No other activities have occurred during the Transition Phase.

7.3 CONTAINMENT BUILDING ACTIVITIES DURING THE TRANSITION PHASE

The containment building will continue to store discarded process equipment through the Transition and S&M Phases of the facility decommissioning process. The discarded process equipment has been moved around within the containment building during the Transition Phase. The primary Transition Phase activities in the containment building have been placing the discarded equipment in the appropriate locations and documenting the hazards (Chapter 4.0, Section 4.4).

7.4 INTERIM STATUS COMPLIANCE AT THE END OF THE TRANSITION PHASE

During the S&M Phase, some of the waste management units within B Plant Complex do not meet all of the requirements for interim status compliance invoked by WAC 173-303-400. The specific requirements of concern include secondary containment, container labeling, monitoring, inspections, and annual integrity testing of tank systems. The inability of the waste management units to meet interim status was a major driver in shutting down and decommissioning the B Plant Complex. It would be impractical and expensive for the B Plant Complex to comply with the interim status requirements during decommissioning.

The Transition Phase activities are designed to addresses the regulatory and environmental concerns caused by not being able to meet the interim status requirements. Therefore, during the S&M Phase, the waste management units will be in an environmentally safe and stable condition that protects human health and the environment without meeting these interim status requirements.

7.4.1 Treatment and/or Storage Vessels

For the hazards associated with each treatment and/or storage vessel, refer to Chapter 4.0, Section 4.2. The regulatory requirements, treatment and/or storage vessels affected, justification of noncompliance, and compliance measures are described in the following sections:

7.4.1.1 Requirement: Daily visual inspections of aboveground tank systems [(WAC 173-303-640(6)(b)].

Vessels affected:

E-5-2	TK-17-1	E-23-3	TK-28-3	TK-36-1
TK-6-2	TK-17-2	E-23-4	TK-28-4	TK-39-1
TK-7-1	T-18-2	TK-24-1	TK-29-2	TK-39-2
TK-7-2	TK-18-3	TK-25-1	TK-29-3	TK-39-5
TK-8-1	E-20-2	TK-25-2	TK-29-4	BCP
TK-8-2	TK-21-1	TK-26-1	T-30-1	BCS
TK-9-1	TK-22-1	TK-26-3	TK-30-3	221-BF-A
TK-9-2	TK-23-1	TK-27-2	TK-32-1	221-BF-B.
TK-10-1	D-23-2	TK-27-3	TK-33-1	
TK-13-1	E-23-3-1	TK-27-4	TK-34-2	
TK-14-2	E-23-3-2	T-28-1	TK-35-2	

Justification: Inspection requirements will not be performed as the vessels are empty, inactive, and isolated. Also, these vessels are inaccessible to personnel during the S&M phase.

Compliance measure: Surveillance of treatment and/or storage vessel systems will be in accordance with the S&M plan.

7.4.1.2 Requirement: Daily visual inspections of aboveground tank systems [(WAC 173-303-640(6)(b)].

Vessels affected: ISO West and ISO East.

Justification: Inspections are not needed for ISO West and ISO East as these vessels will be closed.

Compliance measure: None needed.

7.4.1.3 Requirement: Annual integrity test of tank systems without compliant secondary containment [(WAC 173-303-640(4)(i)].

Vessels affected:

E-5-2	TK-17-1	E-23-3	TK-28-3	TK-36-1
TK-6-2	TK-17-2	E-23-4	TK-28-4	TK-39-1
TK-7-1	T-18-2	TK-24-1	TK-29-2	TK-39-2
TK-7-2	TK-18-3	TK-25-1	TK-29-3	TK-39-5
TK-8-1	E-20-2	TK-25-2	TK-29-4	BCP
TK-8-2	TK-21-1	TK-26-1	T-30-1	BCS
TK-9-1	TK-22-1	TK-26-3	TK-30-3	221-BF-A
TK-9-2	TK-23-1	TK-27-2	TK-32-1	221-BF-B.
TK-10-1	D-23-2	TK-27-3	TK-33-1	
TK-13-1	E-23-3-1	TK-27-4	TK-34-2	
TK-14-2	E-23-3-2	T-28-1	TK-35-2	

Justification: Annual integrity tests will not be performed as the vessels are empty, inactive, and isolated.

Compliance measure: Surveillance will be in accordance with the S&M plan.

7.4.1.4 Requirement: Annual integrity test of tank systems without compliant secondary containment [(WAC 173-303-640(4)(i)].

Vessels affected: ISO West and ISO East.

Justification: Annual integrity tests will not be performed as these vessels and the 276-BA Facility will be closed.

Compliance measure: None required.

7.4.1.5 Requirement: Secondary containment and leak detection [(WAC 173-303-640(4)].

Vessels affected:

E-5-2	TK-17-1	E-23-3	TK-28-3	TK-36-1
TK-6-2	TK-17-2	E-23-4	TK-28-4	TK-39-1
TK-7-1	T-18-2	TK-24-1	TK-29-2	TK-39-2
TK-7-2	TK-18-3	TK-25-1	TK-29-3	TK-39-5
TK-8-1	E-20-2	TK-25-2	TK-29-4	BCP
TK-8-2	TK-21-1	TK-26-1	T-30-1	BCS
TK-9-1	TK-22-1	TK-26-3	TK-30-3	221-BF-A
TK-9-2	TK-23-1	TK-27-2	TK-32-1	221-BF-B.
TK-10-1	D-23-2	TK-27-3	TK-33-1	
TK-13-1	E-23-3-1	TK-27-4	TK-34-2	
TK-14-2	E-23-3-2	T-28-1	TK-35-2	

Justification: No upgrades to the secondary containment or leak detection equipment will be performed as the vessels are empty, inactive, and isolated.

Compliance measure: Surveillance and maintenance to meet leak detection requirements will be in accordance with the S&M Plan.

7.4.1.6 Requirement: Secondary containment and leak detection [(WAC 173-303-640(4)].

Vessels affected: ISO West and ISO East.

Justification: No upgrades to the secondary containment or leak detection equipment will be performed as these vessels and the 276-BA Facility will be closed.

Compliance measure: None needed.

7.4.1.7 Requirement: Major risk labelling of tank systems [(WAC 173-303-400(3)(a)(iii) and WAC 173-303-640(5)(d)].

Vessels affected (all canyon vessels):

E-5-2	TK-14-2	E-23-3-1	TK-27-3	TK-32-1
TK-6-2	TK-17-1	E-23-3-2	TK-27-4	TK-33-1
TK-7-1	TK-17-2	E-23-3	T-28-1	TK-34-2
TK-7-2	T-18-2	E-23-4	TK-28-3	TK-35-2
TK-8-1	TK-18-3	TK-24-1	TK-28-4	TK-36-1
TK-8-2	E-20-2	TK-25-1	TK-29-2	TK-39-1
TK-9-1	TK-21-1	TK-25-2	TK-29-3	TK-39-2
TK-9-2	TK-22-1	TK-26-1	TK-29-4	TK-39-5.
TK-10-1	TK-23-1	TK-26-3	T-30-1	
TK-13-1	D-23-2	TK-27-2	TK-30-3	

Justification: No labeling will be performed as the vessels in the canyon cells are inaccessible to personnel during the S&M phase.

Compliance measure: Major risks (i.e., hazards) for the canyon vessels are documented in Chapter 4.0, Section 4.2.

7.4.2 Cell 4

The interim status compliance concerns for the Cell 4 containers include labeling, monitoring, and inspections. The compliance measures have been developed and are in place and will be used during the S&M Phase. For the hazards associated with the Cell 4 containers, refer to Chapter 4.0, Section 4.3. The regulatory requirements, justification of noncompliance, and compliance measures are as follows.

7.4.2.1 Requirement: Major risk labelling of containers systems [(WAC 173-303-640(3))].

Justification: High radiation levels caused the labels to deteriorate and fall off. Relabeling during the Transition Phase will not be performed because of as low as reasonably achievable (ALARA) concerns and cost. Retrieving containers for relabeling is not possible during the S&M Phase because the canyon crane will not be operable to remove the cell cover blocks. Also, radiation protection concerns for these containers are much greater than the dangerous waste concerns.

Compliance measure: Containers were properly labeled before being placed in Cell 4. A major risk label has been placed on the key cover block to the cell. The major risks (i.e., hazards) for the Cell 4 containers are documented in Chapter 4.0, Section 4.3.

7.4.2.2 Requirement: Weekly inspection of containers [(WAC 173-303-320(2) and WAC 173-303-630(6)].

Justification: Personnel entry into Cell 4 is not feasible because of high radiation levels. Opening the cell cover blocks is not possible during the S&M phase as the canyon crane will not be operable. There are no liquids present in the containers. Also, radiation protection concerns for these containers are much greater than the dangerous waste concerns.

Compliance measure: Surveillance of Cell 4 will not be performed during the S&M Phase.

7.4.3 Containment Building

The containment building meets the interim status requirements in 40 CFR 265.1100 (Subpart DD), invoked via WAC 173-303-400(3)(a). No additional compliance measures are required.

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8.0 POSTCLOSURE PLAN

If waste is left in place, a postclosure plan will be developed to address the disposition scenarios. Groundwater contamination will be investigated and remediated through the operable units under the CERCLA remedial investigation/feasibility study process as directed by the Tri-Party Agreement.

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9.0 REFERENCES

DOE/RL-88-21, *Hanford Facility Dangerous Waste Part A Permit Application*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE, 1996, *Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement)*, Section 14.0, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, Olympia, Washington.

ICF Kaiser, 1996, Letter ETS-W-96-524, G. R. Wagenblast, ICF Kaiser, to S. E. Killoy, Westinghouse Hanford Company, *Certification of the 221-B Building as a Dangerous Waste Containment Building*, dated January 5, 1996, ICF Kaiser, Inc., Richland, Washington.

WHC-SD-WM-TPP-054, *B Plant End Points Document*, Revision 1, B&W Hanford Company, Richland, Washington.

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APPENDIX A

B PLANT COMPLEX EQUIPMENT NOMENCLATURE

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APPENDIX A

B PLANT COMPLEX EQUIPMENT NOMENCLATURE

The designation of equipment, including the treatment and/or storage vessels, in the B Plant Complex follows several different conventions. These conventions can be inconsistent. The convention used can depend on when the equipment was installed and on its original use.

B Plant canyon process cell equipment use a one or two letter equipment type designation, followed by a number for the cell, followed by number for that specific piece of equipment. An additional number can be included if a piece of equipment can be subdivided into two or more distinct components. The one or two letter equipment type designation used shown on Table A1-1. Only the designations D, E, and TK are relevant to the treatment and/or storage systems.

An example of the process cell equipment is TK-17-2, the second vessel (tank) located in Cell 17. If only one piece of equipment is present in a cell, then the numeral "1" is still used, e.g., TK-10-1 is the only equipment in Cell 10. Another example is E-23-3-1. This is one component of the waste concentrator located in Cell 23. Specifically, it is the theromsyphon reboiler on the low-level waste concentrator. Note that not all of the equipment used within the B Plant Complex is part of the treatment and/or storage systems.

Equipment outside the process cells uses a different system. The two vessels in the 221-BB Process Condensate and Steam Building are designated "BCP" and "BCS". While the designation was made with a specific purpose, BCP is not an acronym or an abbreviation and should be defined as such. The two vessels in the 221-BF Condensate Effluent Storage Facility use a location-based designation similar to that used for the process cells, being designated 221-BF-A and 221-BF-B. The two vessels at the 276-BA Interim Organic Storage Facility are designated based on their location. The vessels are ISO West and ISO East.

Table A1-1. Process Cell Equipment Designations Relative to the Treatment and/or Storage Vessels.

Letter designation	Equipment description
D	De-entrainer: separates droplets of liquid entrained in a stream of vapor
E	Heat transfer equipment: i.e., a heat exchanger to heat a liquid or a condenser to cool and condense a vapor
PG	Pulse generator: used to generate a pulse of liquid in the towers
T	Tower: vessel used for separations processes (i.e., solvent extraction or ion exchange)
TK	Tank.

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